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# USSR Report

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BIOMEDICAL AND BEHAVIORAL SCIENCES

No. 44

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## AEROSPACE MEDICINE

### AN EXPERT'S OPINION ABOUT FUTURE SPACEFLIGHTS

Moscow SOVETSKAYA ROSSIYA in Russian 8 Apr 83 p 4

[Article by O. Gazenko, academician, director of the Institute of Biomedical Problems, USSR Ministry of Health]

[Text] Mankind is welcoming the 22d spring of the space age. On 12 April 1961, the world learned the name of the person who blazed the trail for future orbits, Yuriy Alekseyevich Gagarin.

And if we were to try to formulate the main achievement of cosmonautics since that time, it is that man has taken a firm place in space flights, while the "human factor" acquired importance in the strategy and tactics of space exploration and investigation.

What are the directions of development of "space medicine and biology?"

In the first place, we learned the mysteries of the influence of spaceflight conditions on man, animals and plants. In the second place, in the event of their adverse effects a search was made for means of controlling them. For example, we already know quite a bit about the body's reactions to weightlessness and we understand essentially the mechanisms of their onset. In general, the impression is gained that man can adapt satisfactorily to long-term exposure to it. We have also achieved positive results with respect to providing favorable living conditions aboard a spacecraft for man and animals.

True, one should not think that "space medicine" has only extraterrestrial applications. The numerous methods and instruments, which were developed to train cosmonauts and used in orbit are now well-used on our planet. Space experiments also have a substantial influence on development of theories about the origin and evolution of life on earth.

In addition to Soviet scientists, specialists from Bulgaria, Hungary, GDR, Poland, Romania, Czechoslovakia, the United States, France and a number of other countries are participating in research. Joint experiments are being performed in ground-based laboratories, the Salyut orbital stations and Cosmos series of biological satellites.

What then are the principal problems confronting researchers?

As before, work will continue in the area of comprehensive investigation of the mechanisms of vestibular disturbances in man, changes in fluid-electrolyte balance and loss of calcium salts, which is the main building material of the locomotor system.

Gradually, the question of radiation safety of the crew, which was not the main one heretofore, is acquiring acuity. Current flights are being made over routes that are below earth's radiation belts and they do not present any obvious hazard to man. But if we venture on interplanetary launches much will change. Such a prospect requires fuller consideration of the biological effects of heavy particles of cosmic radiation and particularly its effect on the brain. Complete simulation of this type of ionizing radiation is impossible on earth, and this makes it imperative to conduct biological experiments aboard space vehicles.

Flights of the future require development of self-contained ecological systems aboard spacecraft, that would be capable of relatively long and stable existence on the basis of a closed biological cycle of matter, with their own mechanisms of self-regulation and self-control, as it happens in earth's biosphere.

We should also include here the problem of gravity. We must say that, thus far, there is no satisfactory theory on the influence of gravity on living organisms. Biological experiments under spaceflight conditions are a unique tool for investigation of its role in biological processes, such as cell division and transmission of genetic information, growth and development of organisms.

As we see, there are many problems. But what has already been achieved is impressive in any case. The future of space investigations, which sometimes seems fantastic, is even more immense.

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CSO: 1840/568

## SPACEFLIGHT STATISTICS

Moscow SOVETSKAYA ROSSIYA in Russian 8 Apr 83 p 4

[Article: "He Said, 'Let's Go!'" ]

[Text] A total of 114 cosmonauts and astronauts have already traveled in orbit. Of this number, 53 are representatives of the Soviet Union, 51 are U. S. astronauts, 9 are from socialist countries and 1 is from France.

There are two women in the world, Valentina Tereshkova and Svetlana Savitskaya, who have flown in space.

Aboard the "Vostok" spacecraft, in which Yuriy Gagarin flew, acceleration at lift-off reached a 6-fold increase in the cosmonaut's weight and at landing, a 9-fold increase. Four-fold acceleration at landing was achieved in the "Soyuz" series spacecraft.

In coordination with physicians, the work day in orbit has the following schedule: 9 hours of sleep, 2 hours are spent on breakfast, dinner and supper. At least 2.5 hours are spent on exercise. "Housekeeping" duties and clean-up take about 1 hour. About 2 hours are spent on "radio communication" with earth. The rest of the time is used for experiments, observations and ship maneuvering.

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CSO: 1840/569

## CONVERSATION WITH PARTICIPANT IN PREPARATIONS FOR EXTRATERRESTRIAL LAUNCHES

Moscow SOVETSKAYA ROSSIYA in Russian 8 Apr 83 p 4

[Article ["recorded"] by Aleksandr Nemov: "Face to Face with Space---  
Conversation with Participant in Preparations for Extraterrestrial Launches"]

[Text] Tens of thousands of designers, engineers, blue-collar workers and experimenters are on the front line, where they are conquering the universe. It is not always possible to mention their names. But this does not minimize the importance of the cause that they serve.

We submit below the story of one of the immediate participants in preparations for extraterrestrial launches.

### In a World Without Gravity

At one time I dreamed of experiencing weightlessness. To be lightweight, free and to soar in the air. I recall how weightlessness started for me....

I had climbed to the top floor of a large round building. I opened the door to a laboratory. Immediately, I found myself in the hands of specialists. The last instructions, the last readings. Everything was all right. I step through the next door. An enormous hall. In the middle, on a platform there stands a full scale mockup of a space station. The floor appears to be unstable, more precisely it resembles a sieve. *all right*

Slowly, the station submerges in an enormous tank. Several minutes later it is my turn.

The hardest part is first, I put on the space suit. It is suspended on a special crane. I climb into it like medieval knights climbed into their armor. A lid snaps behind my back. Now I can communicate with the "outside" world only by radio. I am in a "suspended" state. The arms and legs cannot be moved much, for there are special lead plates sewn into the suits.

I see Pavel Romanovich Popovich. He waves goodbye to me. The crane lowers me into the water. The cable is disconnected and I submerge smoothly to a great depth. To the same place as the station. From this moment on, my weight and that of the space suit are equalized with the mass of displaced

water. Consequently, according to the law of Archimedes, I am in equilibrium. Weightlessness begins for me.

It is a strange state. I am well-aware of the space suit and orient myself well, but I perform some inconceivable, clumsy movements. I barely swim up to the station. My assignment is rather simple. To "swim into" the station and simulate an exit into space from an airlock chamber. Finally, I am on the initial frontier.

I must get out of the station. My first attempt was a failure. I just cannot go through the open hatch. I try again, a third time....

Now I am outside. A careless movement and I am spinning. Which way is up or down--everything got confused. I am swimming with my feet up [upside down]....

The training is over. I am "hauled" out of the water with the crane. I "exit" from the space suit. I am overcome by fatigue and my legs seem unable to hold me. That's what weightlessness is like!

If I were to add up the time that I "lived" under water, it would be much more than a day. It is only then that I came up with the axiom, "Everything must be done slowly in weightlessness."

Some will find it strange to undergo such training in a tank. But everything is explainable. If man does not learn to live and work without the usual "top and bottom," he will be unable to perform any assignment in orbit. Yet it is very difficult to produce weightlessness for training on the ground. There are only two ways to do it: to create brief (several tens of seconds) absence of gravity while an aircraft is "falling" or to use hydroweightlessness in a tank. The latter is a promising avenue. This is why the unusually shaped building appeared in Zvezdnyy, at the Center for Cosmonaut Training.

Unfortunately, loss of spatial orientation is not the worst element of weightlessness. In a world without gravity and, consequently, without customary loads, the body becomes dehydrated and there is a reduction in muscle mass. Man starts to lose weight.

I remember when I first became acquainted with the "Salyut" station; the "space stadium" did not impress me to any extent. A "treadmill," various expanders ["esponder"?]--what is so special? But I then realized that it is expressly thanks to this set of athletic equipment that it was possible to reach the total of 200 days spent by cosmonauts in orbit.

The mission of Andriyan Nikolayev and Vitaliy Sevast'yanov aboard Soyuz-9 lasted only 18 days, which is not much according to present standards. But 13 years ago this was an achievement. It was difficult for the cosmonauts. Weightlessness ran the gamut of its effects on them. After all, not only was there no "stadium" aboard the spacecraft, but the experimenters did not wear special gear adapted to working under unusual conditions. At the present time, for example, cosmonauts fly in the "Penguin" suit. Special rubber strands are stitched on its fabric. A considerable exertion is

required to make any movement in it. For this reason, whether you like it or not, your muscles are almost always subject to a load. But 13 years ago....

After that flight, many researchers became despondent--would further advances really be made at the cost of such tension? New training, new experiments. The next crew embarks on a mission. Then, suddenly, a phrase from orbit. "We could add another month or so." This was a victory for the medical personnel, designers and, of course, the cosmonauts.

I spent many of the "earth-space" communication sessions at the Center for Medical Observations (located at the Institute of Biomedical Problems, USSR Ministry of Health). Biomedical monitoring data about the health status of the crew come here directly from orbit. All changes in the cardiovascular and skeletomuscular system are recorded.

During the 140-day mission of Vladimir Kovalenok and Aleksandr Ivanchenkov, one of the most important studies was that of erythrocytes, the red blood corpuscles. As we know, the life span of erythrocytes is 120 days. On earth, there is a constant process of their death and generation of new ones. So that in 120 days, their composition changes entirely in human blood. Unfortunately, in space the situation is worse. Preliminary studies have shown that corpuscle reproduction is slower there. For this reason, it could have happened that the number of red blood corpuscles would drop markedly in cosmonauts when the 120-day limit as approached.

During those days, the Center resembled a medical laboratory. Dynamic electrocardiograms were taken on the cosmonauts--continuous recording of the heart's bioelectrical activity all day long.

The blood samples, which the cosmonauts took themselves and transport craft delivered to earth, showed only a rather moderate decline in erythrocytes and hemoglobin. This positive result was related to the fact that the cosmonauts, who used the entire set of planned measures, retained a rather large circulating blood volume.

✓ Each mission yields much new information to space science about weightlessness. But there are also quite a few mysteries. For example, is there an arrest in the process of "leakage" of calcium from bones in the course of a long-term spaceflight? And how can one control this phenomenon?

#### One Hundred Days of Solitude

While weightlessness is "enemy number one," the next important problem is referable to the psychological aspects of a spaceflight. We already see that the cosmonaut has to emerge in two hypostases at the same time--as researcher and subject. Incidentally, this is all in order.

When you undergo the screening stages, of course, the medical commissions check your psyche very thoroughly before placing you in the ranks of cosmonauts. Not only comprehensive tests are performed, but you are carefully observed. It appeared to me, for example, that the long conversations with Mikhail Alekseyevich Novikov, laboratory head at the Institute of Biomedical

Problems happened by chance. The usual communication between two people. We always talked about abstract things, and not a word about cosmonautics. Later one, he confessed that he had been analyzing my state. For it was expressly in those days that many of my friends were "rejected." They were collecting their belongings to return home. Who knows how it all would have ended had I shown pessimism or apathy....

Someone could object: why such rigid screening? The extreme conditions of spaceflights demand that your psyche be prepared for these trials. But screening is only the beginning. There is also special psychological training in store for launch candidates. It comprises several aspects. In the first place, it is impossible to teach a person in advance how to behave in each extreme situation in orbit. One thing can be done, condition his will and self-control, so that he would have a clear head and flexible mind during ChP [an extraordinary event]. This would assure making the correct decision. In the second place, during long-term missions, the subject is affected by sensory deprivation, in other words, absence of usual exogenous stimuli. The problem of psychological compatibility of crews also acquires a different meaning.

"Survival" experiments help condition the will and learn to rapidly make decisions under extreme conditions. This is what such an experiment was like for me. The problem was to reach Lake Issyk-Kul from Alma-Ata in a few days. At first glance, what is the problem? The distance is not very great, 75 km. But the route was charted in a straight line over mountains, rather than on paved roads. Stars were used for navigation. Moreover, you had to arrive at a specific time. I shall not conceal the fact that I lost weight. But these 6 days were not spent in vain for me.

As for questions of "sensory deprivation," I worked as part of the crew for 2 months on a special simulator. Its distinction was that the subjects were in a closed, sealed space. There were no usual contacts with the outside world, and a person was, so to speak, in social isolation. There were some days when I lost interest in the work and there was no desire to take action. I constantly had to overcome these feelings.

Once the command was issued not to sleep for 3 days.

We endured the first day rather easily. On the second day there was an increasingly strong desire to lie down. I tried to load myself with work. My feet and hands felt like lead. By the end of the day I was afraid to sit in a chair for fear that I would fall asleep. Indifference overcame me more and more. On the third day I started to have headaches. The physicians found that my pressure was elevated and pulse fast.

The road to space is not a rose garden....

The work of psychologists is important and responsible. Much depends on how correctly they will be able to answer the question, "Who is this person?" Will they be able to give the subject the necessary help when he is in space, knowing the weak points of his character?



Now a few words about psychological compatibility. This is what Aleksey Gubarev, USSR pilot-cosmonaut upon whom the title of Hero of the Soviet Union was bestowed twice, told me about his mission in Salyut-4 together with Georgiy Grechko: "It was in 1975. At the first stage, in accordance with "regulations," we felt worse and nervous tension increased to the limit; there were some elements of manifestation of discomfort."

"And so, the first 3 days of our work in orbit the relations with Georgiy were virtually the same as on the ground (where we were friends). They were businesslike, friendly, just as healthy as they could be, as required for normal work under these conditions."

"Several more days passed. We sensed that the atmosphere was becoming charged. Sometimes, we differed in assessing the same event."

"I soon noticed that Georgiy became even less self-controlled, abrupt and excited [wound up]. On the ground, he was notable for self-control, modesty and calm."

"The most interesting thing is that this had never happened with us on the ground, in the simulator!"

"We both tried to overcome the 'new nervous state.' We had to somehow smooth out the rough edges, forgive and bear with such deviations in the actions and behavior of our partner."

"We accomplished much...."

It is easy to judge from this example the role played by psychological training of the crew.

### First Step Toward Mars

I have been talking all the time about the difficulties inherent in long-term flights, because the future is beyond them. An expedition, even to earth's closest neighbor, Venus, takes several years. As for orbital flights around our planet, the longer a flight, the more it justifies itself.

There is another problem that is related to prolonging the time a cosmonaut spends under "extraterrestrial conditions"--life support. In order to extend a crew's stay in a station, one has to constantly replenish the stock of water, foods, air, and send "Progress" vehicles in orbit. But, if an interplanetary craft heads for Mars, how is it to be restocked? Scientists have been searching for the answer for many years. There are some things they succeeded in achieving. I shall tell you about an experiment in which I participated.

The room where I was to spend exactly 1 month was striking by its simplicity. There was a rocking chair and a small table. What can I say after I tell you that the size of the room was only 5 cubic meters. It is a sealed cubicle. One can stand up, lie down, sit, and that's all. Even walking is impossible. True, I was troubled most of all by the fact that my entire month's air supply constitutes the volume in which I shall have to live, i.e.,

5 cubic meters. If the air is not renewed, a person could survive for no more than 24 hours.

✓ In my experiment, the job of processing carbon dioxide into oxygen was relegated to green microalgae, Chlorella. There were 30 liters of suspension of this elementary plant, through which the atmosphere of the pressure chamber will be passed....

The door is shut. I see through a small port hole how Ganna Iosifovna Meleshko, doctor of biological sciences, and Yevgeniy Yakovlevich Shepelev, doctor of medical sciences, are "performing magic" with equipment on the outside.

There is something else I failed to mention, my diet included cookies [or crackers] baked of Chlorella. Thus, in this experiment, we tested the possibility of creating a small closed ecological system. The system did not receive either oxygen or water from the outside. Chlorella multiplied and I ate part of the surplus. The carbon dioxide that was discharged when I breathed was absorbed by Chlorella, then discharging oxygen. It reproduced again....

Although the month went by slowly, it was spent quite calmly and well. When I stepped out of the pressure chamber, the physicians who glanced into it observed that the atmosphere was fresh. The air was similar to sea air on the Crimean coast.

Meleshko and Shepelev conducted the next experiment with use of higher plants--wheat, carrots, beets, salad. The planted area constituted a total of 13 square meters.

Concurrently, the scientists tested the effects of space conditions on plants. Chlorella endured weightlessness "perfectly." The flight of Anatoliy Berezov and Valentin Lebedev showed that the higher plant world also feels quite good in orbit. The small weed, Arabidopsis, not only yielded shoots, but later seeds also, which sprouted on earth.

The next direction of research is to include in the closed ecological system representatives of the animal kingdom. Their choice was the Japanese quail. In the first place, it has high-calorie meat and, in addition, there is the possibility of also using its eggs. The first experiment has already been conducted by Soviet scientists in collaboration with Czech researchers.

Yevgeniy Yakovlevich is very optimistic: soon, very soon, it will become possible to minimize appreciably the crew's dependence on earth. And this is an important step in the direction of missions to Mars, Venus and Jupiter.

But, of course, this is only the beginning, and there are still huge problems to be solved by scientists concerned with the Problem of "Man and the Universe."

The longer I work, the more apparent it becomes that space is a road without an end.

10,657

CSO: 1840/568

## SPACEFLIGHT-RELATED QUESTIONS AND ANSWERS

Moscow SOVETSKAYA ROSSIYA in Russian 8 Apr 83 p 4

[Questions from readers and answers reported by V. Pishchik]

[Text] You Asked About 'Living' Satellites

"Were other animals launched into space after the flight of the famous dogs, Belka and Strelka? S. Chugunov."

Ye. A. Il'in, candidate of medical sciences, answers:

In the last decade there have been quite a few biological satellites in orbit. In 1966, the dogs, Veterok and Ugolek aboard Cosmos-110, even broke a record for that time, they spent 22 days in weightlessness!

But it is not only dogs that have worked in orbit. An enormous amount of research was done with the help of white rats. These animals are age-old assistants of biologists and physiologists on earth. They also helped medical men in space.

The experiments with rats made it necessary to solve a complicated set of problems related to life support aboard satellites for these space travelers. Special units were created to house the animals, into which feed and water were delivered upon command, waste was removed, day and night cycles were regulated....

One of the serious questions that we explored was that of the long-term consequences of a spaceflight. For this, a small group of rats, which had been flown in space, was kept under ordinary laboratory conditions up to their natural death. Their life span was found to be just as long as in control animals (which had not been in space). The offspring of the "rat-cosmonauts" also failed to differ from that of the "controls."

At the present time, preparations are in progress for the next experiment: it is planned to send monkeys on a flight aboard a biosatellite, together with animals that had already been in space before.

Tested in the North

"Can one use the advances of space medicine for development of its "terrestrial sister? I. Kolobova."

N. N. Gurovskiy, recipient of USSR State Prize, doctor of medical sciences, responds:

I shall give only a few examples.

At the present time, a number of physiological and psychological tests, which were developed for cosmonaut screening and training are used in medical practice on earth, in particular, clinical medicine; they are related to examination of the cardiovascular system, fluid-electrolyte metabolism and the vestibular system.

Soviet and Czech specialists developed the "Oxymeter" instrument to study changes in oxygen delivery to human tissues during spaceflights. At the present time, it is used extensively for diagnostic purposes in clinical institutions: for examination of patients with peptic ulcer and ischemic heart disease.

The personal hygiene equipment, food allowances and medicine kits developed for life support of cosmonauts were also taken by members of the polar expedition, "Komsomol'skaya Pravda," participants in the transoceanic voyage aboard the "Ra" and "Tigris" during the expeditions of Thor Heyerdahl.

Dinner Aboard "Salyut"

"I should like to know more about the cosmonauts' diet during spaceflights. A. Kozhukhov."

A. S. Ushakov, doctor of medical sciences and recipient of the USSR State Prize, answers:

The total energy expenditure of cosmonauts is slightly over 3000 kilocalories per day. Of course, their food allowance should correspond to this in caloric value.

The menu for the crews of Salyut orbital stations is quite diversified, and it is prepared with consideration of the wishes of the mission participants. There are dishes in tubes, in dehydrated form in packages, canned meat and fish, garnishes, different types of bread and confectionery [or pastries]. Here is an example of the menu for one day.

Breakfast: carbonate, mashed potatoes, fancy wheat bread [enriched], quince bars, coffee with sugar. Lunch: "Rossiyskiy" cheese, "Arctica" crackers, apple juice including pulp. Dinner: jellied sturgeon, spinach [or sorrel] soup, home-style beef, dinner bread, grape and plum juice, prunes. Supper: chopped pork with egg, cottage cheese with nuts, Borodino bread, "Kunzhut" candies, tea with sugar.

The "guests" from socialist countries brought with them into orbit so-called guest assortments, which included national foods.

In order to endure better the last days of long-term flights and the encounter with earth's gravity, as well as to "adapt" better to life on earth, on the final days of the mission it is recommended that cosmonauts take a set of vitamins, amino acids and minerals, which enhance resistance to accelerations.

#### PHOTO CAPTIONS

p 4.      Photos from the files of the Center for Cosmonaut Training:  
trial by sea; man as the object of an investigation; on sweltering  
desert roads; this is the kind of bread that cosmonauts eat.

10,657  
CSO: 1840/568

MEANS FOR INCREASING MAN'S RESISTANCE TO ACUTE HYPOXIA

Moscow FIZIOLOGIYA CHELOVEKA in Russian No 4, Jul-Aug 83 (manuscript received 5 Mar 82) pp 519-526

AGADZHANYAN, N.A. and KATKOV, A. YU., University of People's Friendship imeni Patrice Lumumba, Moscow

[Abstract] A study is made of the limits of human tolerance of acute hypoxia arising upon decreasing air pressure in a pressure chamber and the possibilities of expanding these limits. Studies were performed with 74 volunteers, males 28 to 47 years of age, in whom the tolerance for gradually and rapidly increasing hypoxia in the pressure chamber was determined by a method described earlier. Seven days high mountain adaptation, three day and ten day pressure chamber training and four day, ten day and fourteen day fasting were tested for their influence on hypoxia tolerance. In a separate series of experiments the influence of cooling the body by exposure to 0°C temperature was studied. Seven days high mountain adaptation, three to ten days pressure chamber training and four to fourteen days alimentary fasting increased tolerance for hypoxia to approximately the same extent, raising the "altitude ceiling" by 500-1100 m. The antihypoxic effectiveness of four to ten days fasting was explained by the additional stimulation of the respiratory center and decreased affinity of hemoglobin for oxygen as a result of metabolic acidosis. Zero °C air temperature in itself had no influence on hypoxia, nor on rectal temperature. Great hypoxia (ten minutes at 10,000 M) resulted in a great increase in pulmonary ventilation and blood flow rate and a decrease in rectal temperature and consumption of oxygen by the body. Figures 3; references 23: 16 Russian, 7 Western.  
[716-6508]

UDC 681.2:63.061.4

AUTOMATION OF CONTROL AND MEASUREMENT IN AGRO-INDUSTRIAL COMPLEX

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 4, Apr 83 pp 26-28

RUKHADZE, V.A., Director, Central Scientific Research Institute for Information and Technical and Economic Research in Instrument Making

[Abstract] The response of instrument-making enterprises and instrument users to the Food Program adopted by the May 1982 CPSU Central Committee Plenum involves close coordination and organization of all stages of instrument making from research and development to production and implementation. The author's institute has undertaken special "socialist obligations" to assist state agricultural enterprises in the Istrinskiy Rayon of Moscow Oblast in testing the latest forms of automation and computerization of technological processes. Various measurement and control instruments and procedures to be exhibited at the specialized international exhibition "Automation 83" are discussed. The Soviet pavillion will offer new products and slide-shows demonstrating their use in improving production and storage of agricultural commodities while reducing production expenses. Devices will be shown that measure liquid levels remotely, determine pregnancy of sows, control temperature and humidity in hothouses, provide temperature control for dwellings, and perform numerous scientific measurements of importance in agricultural advancement. Hog-raising operations receive further attention in an exhibit on preparation and distribution of mixed food. Automated systems for land reclamation are also described. Automated remote systems of water distribution for irrigation and flood control will be displayed with both full automation and dispatcher-controlled systems. Figure 1; references 2 (Russian).  
[560-12131]

UDC 636.4.085:685.012.011.56

AUTOMATION OF PROCESSES FOR PREPARING AND DISTRIBUTING FEED IN HOG-RAISING COMPLEXES

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 4, Apr 83 pp 28-29

KOZLOV, Yu. L., and IGNATENKO, T.N., engineers and KONTSUR, V.V. and PISARENKO, V.M., candidates of technical sciences

[Abstract] In an industrial hog-raising operation more than 50 percent of labor is expended on feed mixing and distribution. The Kiev Automation

Institute imeni 25th S"yezda KPSS has developed an automated system with two independent subsystems, one to prepare liquid feed and the other to distribute it throughout the complex. The first administers proper amounts of each type of feed and water, then shuts off automatically when mixing operations are completed. The second moves the feed by pipelines to only those stalls containing swine, and gives preset amounts as required at each stall. Computerized operation is planned for future versions. At a test hog-raising operation, the implementation of the feed preparation sub-system alone brought annual savings of 103,000 rubles. Figures 2, reference 1 (Russian)  
[560-12131]



UDC 579.252.52:579.254

STUDY OF F-LIKE pAP42 GENE TRANSFER FACTOR

Moscow BYULLETEN' EKSPERIMENTAL'NOY BIOLOGII I MEDITSINY in Russian No 4, Apr 82 (manuscript received 14 Sep 81) pp 85-88

GUBAR', Ye.V. and PEKHOV, A.P.; Department of Biology and General Genetics, Patrice Lumumba People's Friendship University, Moscow

[Abstract] A study is made of the sensitivity of E. coli K-12 cells containing pAP42 transfer factor to F-phages. The frequency of transfer of this factor from one cell to another was studied to determine its relation to plasmids of F incompatibility groups. The experiments utilized versions of the pAP42 transfer factor genetically labeled by transposition of Tn1 and Tn9. The data obtained indicate that the factor is an F-like plasmid depressed in conjugativeness function. The factor is fully compatible with the reference plasmids of the F-incompatibility groups studied. Reference 8: 7 Russian. 1 Western.  
[258-6508]

UDC: 612.4:577.12

STUDY OF ACTIVITY OF NAD-DEPENDENT DEHYDROGENASES AND THEIR ISOENZYMES IN HUMAN BLOOD BY BIOLUMINESCENT METHOD USING SOLUBLE AND IMMOBILIZED BACTERIAL LUCIFERASE

Moscow DOKLADY AKADEMII NAUK SSR in Russian Vol 270, No 5, Jun 83 (manuscript received 6 Dec 82) pp 1239-1242

ISMAILOV, A.D., DANILOV, V.S. and YEGOROV, N.S., Moscow State University imeni M. V. Lomonosov

[Abstract] Bioluminescent enzyme analysis is based on conjugation through pyridine-nucleotide NAD(P)-dependent and bioluminescent enzyme systems. The present work utilized luminescent bacteria Photobacterium fisheri. The specifics of functioning of a polyenzyme system including NAD-dependent dehydrogenase and bacterial luciferase was studied as applicable to analysis of enzymes and metabolites in biological tissues using the bioluminescent activity of luciferase as an indicator of the dehydrogenase activity of the enzyme. Particular attention was given to lactate dehydrogenase and its isoenzymes, since the activity of human-blood-plasma enzymes and isoenzymes is used in clinical diagnosis as a test for various diseases, particularly

infarction, hepatitis, muscular dystrophy and others. The results obtained indicate that the bioluminescent method described can be successfully used to analyze the activity of plasma dehydrogenase, its high sensitivity allowing the use of a minimum quantity of biological material for the analysis (10  $\mu$ l blood plasma diluted 1000 times suffices). Figures 4; references 14: 4 Russian, 10 Western.  
[569-6508]

UDC: 616.127-008.931-02:513.863

INFLUENCE OF ANTIOXIDANT ON RESISTANCE OF UNTRAINED ORGANISM TO MAXIMUM PHYSICAL LOAD

Moscow BYULLETEN' EKSPERIMENTAL'NOY BIOLOGII I MEDITSINY in Russian No 7, Jul 83 (manuscript received 13 Jan 82) pp 17-19

MEYERSON, F.Z., KRASIKOV, S.I., BOYEV, V.M. and KAGAN, V. Ye., Institute of General Pathology and Pathological Physiology, USSR Academy of Medical Sciences, Moscow; Orenburg Medical Institute

[Abstract] A study is made of the influence of preliminary administration of a peroxide oxidation inhibitor, the antioxidant M-1, on the maximum duration of standard physical load tolerated by untrained animals, on enzyme activity and on lactate concentration in the blood. The experiments were performed on 97 male Wistar rats, weight about 200 g. The animals were exercised by forced running on a treadmill after various doses of M-1 in either single dose or over 3 days time. The maximum running time in the control animals averaged 67 minutes, in the animals which received the antioxidant 108 minutes. Key enzyme activities were increased by factors of 2 to 2.8. Animals which received the peroxide oxidation inhibitor showed significantly lower enzyme activity levels. Blood lactate concentrations were almost halved by administration of M-1 before forced exercise. References 10: 3 Russian, 7 Western.  
[719-6508]

UDC: 612.748.014.46:577.175.822].  
014.46:615.224

INFLUENCE OF VERAPAMYL AND MANGANESE IONS ON ACETYLCHOLINE SENSITIVITY OF MEMBRANE OF INNERVATED AND DENERVATED FROG MUSCLE FIBERS

Moscow BYULLETEN' EKSPERIMENTAL'NOY BIOLOGII I MEDITSINY in Russian No 7, Jul 83 (manuscript received 21 Jul 81) pp 25-27

VOLKOV, Ye. M., Department of Biology and Biophysics, (headed by Professor G. I. Poletayev), Kazan' Medical Institute

[Abstract] The influence of verapamyl on the acetylcholine sensitivity of denervated and intact frog muscle fiber membranes was studied. The experiments were performed on the frog sartorius muscle in winter by the usual micro-electrode technique. Denervation was performed under ether narcosis by

extirpation of a 2-3 mm nerve section 1.5-2 cm from the point of its insertion into the muscle. The influence of verapamyl or replacement of  $\text{Ca}^{2+}$  in the solution by  $\text{Mn}^{2+}$  as determined from the change in percent of membrane acetylcholine sensitivity as measured in millivolts/nK with respect to the initial value which was taken as 100. Verapamyl was found to depress acetylcholine sensitivity of denervated frog muscle membrane more than innervated end plate membrane. Replacement of  $\text{Ca}^{2+}$  by  $\text{Mn}^{2+}$  changed the acetylcholine sensitivity of the denervated muscle membrane almost as in the control. Twenty minutes after replacement of the solution the acetylcholine sensitivity was  $60 \pm 18$  percent, which effect disappeared completely after washing of the muscle for 30 minutes. Figure 1; references 10: 4 Russian, 6 Western.  
[719-6508]

UDC: 616.89-088.441.13-092.9-07:616-088.94:  
557.175.823]-02:547.262

SEROTONIN CONTENT IN VARIOUS SEGMENTS OF THE BRAIN, LIVER, INTESTINE AND BLOOD  
IN RATS PREDISPOSED AND NONPREDISPOSED TO ALCOHOL CONSUMPTION

Moscow BYULLETEN' EKSPERIMENTAL'NOY BIOLOGII I MEDITSINY in Russian No 7,  
Jul 83 (manuscript received 4 Mar 82) pp 35-37

ZHUKOV, V.N., ZHODOROVA, N.A., and BUROV, Yu. V., Laboratory for Study of  
Substances for Prophylaxis and Treatment of Narcomania, (headed by Doctor of  
Medical Sciences Yu. V. Burov, Institute of Pharmacology, USSR Academy of  
Medical Sciences, Moscow

[Abstract] The purpose of this work was to study the content of serotonin in various segments of the brain and in peripheral organs and tissues upon administration of ethanol to rats, some of which were predisposed to consumption of alcohol. The experiments showed that in predisposed animals the level of serotonin was higher in the hypothalamus and brain stem, lower in the thalamus and striatum. Rats in both groups showed an increase in the content of serotonin in the liver and blood following consumption of alcohol. Serotonin content in the intestine of animals predisposed to alcohol consumption decreased somewhat under the influence of ethanol. The data thus indicate a possible modulating role of the serotonergic system of the hypothalamus in the positive or negative effects of ethanol in the animals tested. References 11: 9 Russian, 2 Western.  
[719-6508]

## MECHANISM OF DISRUPTION OF ANDROGENOPOIESIS IN STRESS

Moscow BYULLETEN' EKSPERIMENTAL'NOY BIOLOGII I MEDITSINY in Russian No 7,  
Jul 83 (manuscript received 13 Oct 81) pp 98-100

ALESHIN, B.V., and Bondarenko, L.A., Kharkov Scientific Research Institute of  
Endocrinology and Hormone Chemistry

[Abstract] A study was made of the functional and structural changes in the testes in stress. Experiments were performed on 28 young reproductively-mature rabbits. Stress was evoked by daily immobilization for one hour and simultaneous electric shock for a period of two weeks. The current was selected strong enough to cause contraction of the muscles of the posterior extremity. Androgen activity of the testes was judged from the content of the testosterone and androstendione in the blood of the spermatic vein. Long-term stress caused a sharp decrease in testicular androgenopoiesis, the secretion of testosterone dropping to 16 percent, androstendione to 4 percent of the level of these hormones in intact rabbits. The depression of androgen activity resulted from reduction in the production of male reproductive hormones directly in the testes, related in part to greatly increased production of prolactin in the hypophysis. The interstitial Leydig cells retained their structural integrity indicating that the path of biosynthesis of androgens is diverted to the formation of steroids not characteristic for the activity of the intact gonads. Figure 1; references 14: 1 Russian, 13 Western.  
[719-6508]

## QUANTITATIVE ANALYSIS OF RAT MITROCHONDRIAL CARDIOMYOCYTES IN ADAPTATION TO ALTITUDE HYPOXIA

Moscow BYULLETEN' EKSPERIMENTAL'NOY BIOLOGII I MEDITSINY in Russian No 7,  
Jul 83 (manuscript received 4 Mar 82) pp 116-118

KONONOVA, V.A., Kirgiz Scientific Research Institute of Obstetrics and  
Pediatrics

[Abstract] A study was made of the dynamics of quantitative structural-functional mitochondrial indices of various rat cardiomyocyte zones upon long-term adaptation to high altitude hypoxia. Experiments were performed on mature white male rats, adapted to a high altitude by daily placement of the animals in a pressure chamber with a chamber altitude of 9000 m for 90 days, gradually increasing from 2 hours to 6 hours per day. The animals were allowed to "descend" for 15 to 20 minutes to an altitude of 6000 m every 2 hours to assure survival. Some of the animals were sacrificed on days 1, 5, 10, 20, 45, 60 and 90, the myocardium of the right ventricle fixed in 3 percent glutaraldehyde and 1 percent  $\text{OsO}_4$ . Ultrathin sections were studied in an electron microscope. One-time elevation to 9000 m caused most mitochondria from all zones of the cardiomyocytes to be swollen, increased in size with expanded intercryst spaces. By day 45-60 of the experiment, the number of mitochondria

in various zones of the cardiomyocytes changes, sometimes increasing, sometimes decreasing. The mitochondrial density index reaches its maximum in all zones by day 45. Quantitative analysis revealed certain regularities in the structural-functional restructuring of the mitochondria upon long-term adaptation to extreme altitude. The reaction of the mitochondrial apparatus was very rapid, appearing in the first day of the experiment as an increase in the total number and specific area of mitochondria in the myofibrillar and perinuclear zones. By the end of the experiment both the intensity of newly formed mitochondria and the specific area they occupy, as well as the total number and length of crysts all decreased. This indicates gradual exhaustion of the functional reserves of the intracellular organelles, so that adaptation to extreme altitude does not occur. References 10 (Russian).  
[719-6508]

UDC 612.014

REDUCING ELECTRICAL STABILITY AS A BASIC MECHANISM OF DESTROYING THE BARRIER  
FUNCTION OF BIOMEMBRANES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 270, No 6, Jun 83 (manuscript  
received 14 Dec 82) pp 1489-1492

PUCHKOVA, T.V., PUTVINSKIY, A.V. and VLADIMIROV, Yu. A., Second Moscow State  
Medical Institute imeni N. I. Pirogov (presented by academician A. A. Krasnovskiy  
6 Dec 82)

[Abstract] To study the increased permeability that accompanies numerous ailments of cardio-vascular, nervous and radiation illnesses, the authors examined four basic mechanisms: excess lipid oxidation, activation of endogen membrane phospholipases, stretching of membranes with osmotic cell stretching and adsorption of polyvalent ions, especially proteins, on the infected membrane. Using phospholipids from white rat liver mitochondria and egg lecithin, they studied electrical breakdown of a bilayer lipid membrane under laboratory conditions. Formation of pores that permitted permeation involved all four of the mechanisms mentioned above. Surface tension at the water-lipid boundary also declined. The electrical breakdown was judged to be the universal direct cause of loss of the barrier function of the lipid bilayer. Figure 1, references 14: 11 Russian, 3 Western.

[570-12131]

UDC 591.5:587

HYDRAULIC CHARACTERISTICS OF A FLOW FORMING FISH MOVEMENT ROUTES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 270, No 6, Jun 83 (manuscript  
received 9 Dec 82) pp 1513-1516

PAVLOV, D.S., BAKERYAN, A. Sh., SKOROBOGATOV, M.A. and SHTAF, L.G. (deceased),  
Institute of Evolutionary Morphology and Ecology of Animals imeni A. N. Severtsov,  
USSR Academy of Sciences, Moscow (presented by academician V. Ye. Sokolov  
9 Nov 82)

[Abstract] In connection with providing ways for spawning fishes, the authors studied hydraulic features of water flow and their effects on *Rutilus rutilus* at the Uglich reservoir, with water flow at 29-36 cm/sec. The reactions of the fish in the fishway were recorded on movie film. Analysis of the data collected

showed that fish hold to a given depth in the flow, although they react to the trough's walls and other design features. Longitudinal and lateral characteristics of the flow were independent, and differences in experimental data were attributed to peculiarities in each group of fish studied, rather than to experimental error. Lateral gradient and flow rate had direct effect on the relative rate of movement of the fish groups, but intensity of turbulence did not. At low flow rates, the fish tended to move into the stronger current, while with increased flow and more intense turbulence, the reverse occurred. The data collected were used to predict fish entry into fish ladders; that research will be the topic of a later report. Figures 2, references 5: all in Russian.  
[570-12131]

UDC 681.142:54

"ISKRA" ASSEMBLY FOR AUTOMATION OF CHEMICAL AND BIOLOGICAL RESEARCH

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 7, Jul 83 pp 102-107

KAZARINOV, V.Ye., doctor of chemical sciences

[Abstract] A description is provided of studies initiated in 1974 under the auspices of the Presidium of the USSR Academy of Sciences (AS), on the design of a data processing system suitable for chemical and biological research. The objective was to devise a system that could readily be used by scientists with no particular competence in data processing, with the initial studies undertaken at the Institute of Electrochemistry. The result was the Iskra 226.6 terminal-dialog minicomputer capable of computer graphics and utilizing BASIC language. Head institute in creating the Iskra unit was the Institute of Electrochemistry, AS; associated in the work were the Institute of Bioorganic Chemistry, Institute of Molecular Genetics, Institute of Petrochemical Synthesis, Institute of General and Inorganic Chemistry, Institute of Chemical Physics and, also, other AS organizations. Figures 3.  
[607-12172]

UDC 661.1:681.3:18.4.62-5

"BIOTSIKL" MICROPROCESSOR COMPLEX FOR CONTROLLING PERIODIC FERMENTATION PROCESSES

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 4, Apr 83 pp 29-30

OPRISHKO, A.A., director, "Promavtomatika" Scientific Production Association, BABAYANTS, A.V. and KHANUKAYEV, A. Ya., candidates of technical sciences and DAVYDOV, V.P., ALESHECHKIN, V.V. and CHERNER, S.M., engineers

[Abstract] Microbiological synthesis in fermentation produces medicines, foods and other industrial products which then require separation. Sterilization, inoculation and other stages in processing operate in sequence, so that consistency in operation is of key importance. The authors present a decentralized control system that collects needed technical information and selects procedures and operation times, monitors and actually conducts necessary processes and passes on data to the next stage of production. The microprocessor components and the work station provide comfortable and efficient working conditions that result in increased concentrations of the final product in shorter time and yield other production savings. Figures 2, references 2 (Russian).  
[560-12131]



UDC: 591.5

ONE MECHANISM OF ORIENTATION OF FISH DURING LONG MIGRATIONS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 270, No 5, Jun 83 (manuscript received 24 Nov 82) pp 1272-1275

CHURMASOV, A.V., UL'YANOV, M. Yu. and PROTASOV, V.R., Institute of Evolutionary Morphology and Ecology of Animals imeni A.N. Severtsov, USSR Academy of Sciences, Moscow

[Abstract] A study was made of the mechanism of orientation of long-range migrant fishes using the humpback salmon as an example. The experiments were performed on Iturup Island and in the Okhotsk Sea in August-September of 1972-1974 by a combination of methods: labyrinth, labeling and mathematical modeling. The mathematical model of the behavior of the fish in a labyrinth, based on the theory of Markov chains, revealed a tendency among the experimental fish toward movement which could be expressed graphically as a vector showing the direction and length of movements. Comparison of experimental results performed in an open labyrinth on sunny days and cloudy days or with fish which had been blinded showed that the tendency toward movement appears only when the sun is visible. When the sun was invisible or when fish were blinded the fish were equally likely to move in any direction. During clear weather, nonblinded fish constantly tended to move in the same direction throughout the day. Other experiments indicated that the fish guided themselves by a combination of the sun and local landmarks during their spawning migration, remembering the direction of movement and coordinating it with the coordinates of the sun until the fish reached the next remembered landmark. Figures 3; references 9: 5 Russian, 4 Western.  
[569-6508]

UDC: 612.017.1:612.014.4-063

LEVEL OF NORMAL ANTIBODIES AND IMMUNOGLOBULINS IN HUMAN SERUM IN EXTREME ANTARCTIC CONDITIONS

Moscow ZHURNAL MIKROBIOLOGII EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 4, Apr 83 (manuscript received 14 Jun 82) pp 106-109

YEVDOKIMOV, V.V., PETROSOV, V.V. and SKVORTSOV, V.T., Institute of Epidemiology and Microbiology imeni N.F. Gamalei, USSR Academy of Medical Sciences, Moscow

[Abstract] The dynamics of normal antibodies was traced among polar workers in the Antarctic. The workers were exposed simultaneously to a combination of

factors including bioisolation. The serum of 27 polar workers who spent a year at "Vostok" station during the 17th Soviet Antarctic expedition was studied. The serum was stored at  $-20^{\circ}\text{C}$  and serum immunoglobins were determined by the method of Mancini. Under conditions of bioisolation during the winter the level of normal antibodies gradually decreased until the middle of polar night, and by the end of the winter had dropped to half the original level. The reduced level of normal antibodies and immunoglobulins coinciding with outbreaks of upper respiratory infections reflected the status of the infection defense of the organism under conditions of bioisolation. References 15: 14 Russian, 1 Western.  
[720-6508]

UDC: 616.9-022.32-036.22-092:[612.017:1:612.6.052

HETEROGENEITY OF HUMAN IMMUNORESISTANCE TO INFECTIOUS DISEASE PATHOGENS IN THE  
EPIDEMIC PROCESS OF AEROSOL ANTHROPOSES

Moscow VESTNIK AKADEMII MEDITSINSKIH NAUK SSSR in Russian No 5, May 83 (manu-  
script received 15 Dec 81) pp 55-60

DEGTYAREV, A.A., Leningrad

[Abstract] Results of analysis of the distribution of persons according to frequency of disease confirm the hypothesis that there exist among adults so-called practically-healthy-contingents which are predisposed to frequent infection with aerosol anthroponosis pathogens due to insufficient infection resistance. A study of the structure of patients with influenza and upper respiratory disease, streptococcus and staphylococcus infections in various age and occupation groups of the population living in various climatic and geographic areas has shown that the composition and population of the contingent of frequently ill persons fluctuate widely. Its number is highest in large groups with particularly high risk of infection and when the organism is manifesting stress reaction to unfavorable environment factors. Insufficient immunoresistance most frequently appears during the initial period of adaptation of the organism to new living conditions. There are two groups of environmental factors facilitating the appearance of genetically defined weakness of the immunologic potency of the organism. One is related to conditions of exposure of the individual. The second group of factors is related to stress effects of living conditions on the organism. Figures 2; references 10: 8 Russian, 2 Western.  
[570-6508]

UDC: 578.833.27:578.233.4

PERSISTENCE OF TICK-BORNE ENCEPHALITIS VIRUS AND ITS SEQUELAE

Moscow VESTNIK AKADEMII MEDITSINSKIKH NAUK SSSR in Russian No 5, May 83 (manu-  
script received 17 Jul 81) pp 67-73

POGODINA, V.V., Institute of Poliomyelitis and Viral Encephalitides, USSR Academy of Medical Sciences, Moscow

[Abstract] Results are presented from work at the Laboratory of Encephalitis Immunology on studies of the regularity of persistence of the tick-borne encephalitis virus in primate experiments. Persistence developed after an occurrence

of the disease and after nonapparent infections as well. The virus persisted for over two years in the first case, about one year in the second. The immunologic aspects of persistence are discussed. Four types of immune response are noted when the virus persists in the organism of the apes: appearance of all types of antibodies followed by a reduction in their titer or their disappearance; stable high or increasing level of antibodies; cyclical rising and falling of humoral immunity; and dissociation of the antibodies--presence of virus neutralizing antibodies without antihemagglutinins, sometimes with no complement bonding or precipitating antibodies. Various sequelae were observed: 1) cessation of persistence; 2) indefinite persistence with a symbiotic relationship between the virus and host in spite of immunity; 3) development of subacute and chronic disease. References 18: 16 Russian, 2 Western.  
[570-6508]

UDC: 911.2:616.981.45(574.12)

#### VALUES OF NATURAL FACTORS FOR INDICATION OF PLAGUE FOCI IN THE NORTHEASTERN CASPIAN REGION

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA, SERIYA 5: GEOGRAFIYA in Russian No 4, Jul-Aug 83 (manuscript received 7 Dec 82) pp 47-52

DANILENKO, I.D., KUROLAP, S.A. and ROTSHIL'D, Ye. V.

[Abstract] Indication of natural disease foci based on a combination of geographic factors is a little-studied but very promising research trend. Studies in the literature have repeatedly drawn attention to the geomorphologic conditions, nature of soil, level and salinity of groundwater as possible factors in the propagation of epizootic plague among rodents. This article describes an analysis of the territory between the lower reaches of the Emba River, Caspian Sea and Ustyurt. The entire 28,000 km<sup>2</sup> territory was divided into 37 primary regions, each relatively homogeneous in terms of relief, soil conditions, vegetation and rodent population. Mean epizootic indices were determined for all regions during high and low activity years as well as on the average for 14 years. Based on these results the regions were classified according to characteristics of epizootic plague occurrences. It is found that regions with high salt dome structures were favorable for the development of epizootic plague foci in the area. Foci also develop in territories with high salinity or areas with predominance of sandy loam soils and fresh or slightly mineralized groundwater. Figures 1; references 10 (Russian).  
[576-6508]

PREDICTING EPIDEMIC MANIFESTATION OF NATURAL HUMAN DISEASE FOCI

Moscow MEDITSINSKAYA PARAZITOLOGIYA I PARAZITARNYYE BOLEZNI in Russian No 3, May-Jun 83 (manuscript received 31 Jan 83) pp 3-10

KORENBERG, E. I. and YURKOVA, Ye.V., Institute of Epidemiology and Microbiology imeni N.F. Gamaleya, Moscow

[Abstract] An attempt is made to generate a universal flow chart for prediction of the epidemic manifestation of natural human disease foci. The characteristics of the predicted object are expressed quantitatively as structured block elements of the model. The authors consider the article to be a prognostic retrospection, intended to create a hypothetical quantitative model of the predicted object. It is noted that any prediction is a presumption based on probabilistic approaches so that the prediction of morbidity with natural focal infections is possible but not precise. Figure 1; references 76: 75 Russian, 1 Western.

[717-6508]

UDC: 616.9-022.395.42-038.2(575.4)(252)

EPIZOOTOLOGY OF CERTAIN TRANSMISSIVE NATURAL FOCAL INFECTIONS IN KARAKUMY

Moscow MEDITSINSKAYA PARAZITOLOGIYA I PARAZITARNYYE BOLEZNI in Russian No 3, May-Jun 83 (manuscript received 17 Mar 82) pp 11-14

BERDYEV, A. and PCHELKINA, A.A., Institute of Zoology, Turkmen SSR Academy of Sciences, Ashkhabad, Institute of Epidemiology and Microbiology imeni N.F. Gamaleya, USSR Academy of Medical Sciences, Moscow

[Abstract] Factual materials are presented collected in recent years in Karakumy as well as the authors' view on possible paths of circulation of natural focal infection pathogens in the desert, ecologically related to the ticks *H. asiaticum asiaticum*. The experiments utilized guinea pigs and white mice. The ticks were treated with alcohol, then saline solution, ground in a mortar and pestle, centrifuged and the supernatant fluid administered to the guinea pigs and mice. It is concluded that the circulation of pathogens in a desert disease-focus such as that along the Karakumy canal involves a limited number of species of ticks and many species of vertebrates. The dominant tick type here involved is *H. asiaticum asiaticum*, the dominant vertebrate the great gerbil. Two strains of *C. burneti* from naturally-infected ticks were obtained in these experiments; strains of West Nile fever virus were also isolated. Participation of cattle as Q-rickettsiosis, tick-borne typhus and West Nile fever pathogen reservoirs was proven. References 14 (Russian).

[717-6508]

RESTORATION OF NATURAL PLAGUE FOCI AS A RESULT OF DISTANT TRANSFER OF DISEASE  
PATHOGENS BY VARIOUS ANIMALS

Moscow MEDITSINSKAYA PARAZITOLOGIYA I PARAZITARNYYE BOLEZNI in Russian No 3,  
May-Jun 83 (manuscript received 27 Jan 81) pp 31-37

DYATLOV, A.I., Scientific Research Antiplague Institute of the Caucasus and  
Transcaucasus, Stavropol

[Abstract] Over 50 publications have spoken out in favor of the idea of periodic natural cleansing with subsequent reinfestation of natural plague foci by long distance transfer of the pathogen by homoiotherms and infested ectoparasites from other natural foci. Three possible methods of long distance transfer are discussed: with diseased mammals or fleas which they carry, diseased fleas carried by birds in flight; and diseased birds. Each of these is analyzed along with examples used to confirm the possibility of each type of transfer. A number of problems with each of the suggested mechanisms is mentioned, including the impossibility of barriers between plague foci to small rodents, the short distances traveled by flea-carrying birds in comparison to the distances which would be necessary to reinfest previous foci, and the illogical relationship of geographic location types where reinfestation occurs if any of these three mechanisms were the means of reinfestation. References 25: (Russian).  
[717-6508]

EXPERIMENTAL INFESTATION OF ISABELLINE WHEATEAR (OENANTHE ISABELLINA TEMM.,  
1829) WITH PLAGUE PATHOGEN

Moscow MEDITSINSKAYA PARAZITOLOGIYA I PARAZITARNYYE BOLEZNI in Russian No 3,  
May-Jun 83 (manuscript received 2 Nov 81) pp 37-41

MARTYNOV, G.A., SHEVCHENKO, V.L., STEPANOV, V.M., MARTYNOVA, N.V.,  
GRAZHDANOV, A.K. and ZHARINOVA, L.K., Urals Antiplague Station, Ural'sk

[Abstract] A special experiment was performed to obtain additional information to confirm or deny the opinion that rodent fleas are incapable of forming a block by consuming the blood of birds. Ninety birds were used in the experiments, infected subcutaneously by microbe suspensions in saline solution. The fleas were used in the second experiment, infested by gerbils then put together with the birds. The species *X. conformis*, *X. skrjabini*, *C. laeviceps* and *C. Tesquorum* were found to be capable of forming a block upon infestation of dying wheatears. References 4 (Russian).  
[717-6508]

INTERSPECIES PARASITE CONTACT IN ARAL KARAKUMY NATURAL PLAGUE FOCUS

Moscow MEDITSINSKAYA PARAZITOLOGIYA I PARAZITARNYYE BOLEZNI in Russian No 3, May-Jun 83 (manuscript received 10 Nov 81) pp 46-50

BURDELOV, L.A., ZHUBANAZAROV, I.Zh., KOCHKINA, L.I., ZOLOTOVA, S.I., KAL'ZHANOV, K.K. and RUDENCHIK, N.F., Central Asian Scientific Research Antiplague Institute, Alma-Ata; Aral Sea Antiplague Station, Aral'sk

[Abstract] A study was made of multi-year material based on small mammal fleas collected in the process of epizootologic examination of the Aral area Karakumy in 1964-1980 to provide an approximate evaluation of the intensity of interspecies parasite connections. Fleas from the great gerbil were found on many rodents and predators in the area. The massive exchange of ectoparasites among primary and several secondary plague carriers forces one to recall the possibility of significant influence of the latter on the nature and stability of the epizootic process. The impression is created that in the central Asian flea focus the great gerbil is the factor which connects the entire combination of species of potential plague carriers. References 20 (Russian). [717-6508]

UDC: 613.6(47+57)

USSR FOOD PROGRAM THROUGH 1990 AND IMMEDIATE LABOR HYGIENE TASKS

Moscow GIGIYENA TRUDA I PROFESSIONAL'NYYE ZABOLEVANIYA in Russian No 11, Nov 82  
pp 4-7

ROSHCHIN, A.V., Central Institute for the Advanced Training of Physicians

[Abstract] The May 1980 plenum of the CC CPSU approved the USSR food program through 1990 in accordance with the resolutions of the 26th CPSU Congress. The plenum approved the resolutions of the Party Central Committee and USSR Council of Ministers for practical achievement of the goals set forth in the food program. This has resulted in a significant orientation of all branches of the economy toward solution of problems of further increasing agricultural production. The food program reflects the long-term strategy and tactics of the building of communism. The agrarian policy of the Party and the food program have set new tasks before hygienic science and sanitary practice. Institutes and departments of hygienic profile and sanitary-epidemiologic stations are being actively included in the work directed toward successful implementation of the food program. Hygienists must recall that further industrialization of agriculture requires comprehensive development of the level of scientific studies to develop hygienic norms for production factors and working conditions in various branches of agriculture. Increasing the level of sanitary supervision will be impossible without a significant increase in scientific research in the area of agricultural hygiene. The workers of scientific hygiene institutions and sanitary-epidemiologic stations are making a significant contribution to implementation of the food program.

[571-6508]



RADIATION MUTAGENESIS AND INHIBITION OF DNA SYNTHESIS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 270, No 6, Jun 83 (manuscript received 10 Feb 83) pp 1479-1482

DUBININA, L.G., SERGIYEVSKAYA, S.P. and KURASHOVA, Z.I. and N.P. DUBININ, academician, Institute of General Genetics, USSR Academy of Sciences, Moscow

[Abstract] Inhibition of DNA synthesis has been used to study such anti-carcinogen and antiviral preparations as 1-beta-D-arabinofuranosylcytosine (ara-C) in their role as modifiers of radiation mutagenesis. Since no such studies had been successful with plants, the authors irradiated *Crepis capillaris* meristem cells with X-rays at 9.3 GR for 7 hours in one stage and at 1.9 GR for 3 hours in a second stage. Ara-C treatment was administered before, after or in combination. Only chromosome types of restructuring were observed, indicating that sensitization occurred during the first phase (G1). The effects of the DNA synthesis inhibitor were studied before, after, and before-and-after irradiation with varying periods of X-ray treatment. Biochemical study indicated that ara-C has multiple effects on cells, and hence on mutation fixation processes, and may be tied to cell utilization of supplemental energy during irradiation. Both replicative and reparative DNA synthesis was inhibited by the ara-C. The processes observed in this study can be of significance for the anti-carcinogenic and antiviral action of ara-C, and further research is recommended. Figures 3; reference 15: 3 Russian, 12 Western. [570-12131]

## GENE OF DNA-LIPASE OF THE T-4 BACTERIOPHAGE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 270, No 6, Jun 83 (manuscript received 18 Apr 83) pp 1495-1500

KRAYEV, A.S., ZIMIN, A.A., MIRONOVA, M.V., YANULAYTIS, A.A., TANYASHIN, V.I. and SKRYABIN, K.G. and BAYEV, A.A., academician, Institute of Molecular Biology, USSR Academy of Sciences, Moscow; Institute of the Biochemistry and Physiology of Microorganisms, USSR Academy of Sciences, Pushchino; and All-Union Scientific Research Institute for Applied Enzymology, Vilnius

[Abstract] The DNA-ligase of the T-4 bacteriophage previously coded as the early gene 30 is essential for replication, recombination and reparation of phage DNA as well as for packing the latter is capsid. The authors determined the primary structure of a cloned DNA fragment containing a gene of polynucleotide ligase, using two independent methods with computers that stored and processed structural data. A plasmid clone was used for sequencing the cloned fragment by the Maxam-Gilbert method, while clones based on M13 were used with a terminal analog method and the "universal" 17-member oligodesoxy-ribonucleotide primer. The DNA of recombinant plasmid was obtained from *E. coli* strain B384. Computer information gene 30 structure is presented and discussed. Results indicate that gene 30 is preceded by yet another gene that has not yet been identified, but which codes the polypeptide of 87 amino acids. The authors consider their work to be an important initial step toward in vitro production of protein for physicochemical research. Figures 2; references 10: all Western.

[570-12131]

# SELECTED BONDING OF CERTAIN NUCLEOTIDE SEQUENCES OF GENE ACTIVATORS OF ESCHERICHIA COLI AND PHAGE T7 WITH CORRESPONDING RNA-POLYMERIZATION

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 270, No 6, Jun 83 (manuscript received 10 Feb 83) pp 1501-1504

SAVINKOVA, L.K., KNORRE, V.L. and SALGANIK, R.I., corresponding member, USSR Academy of Sciences, Institute of Cytology and Genetics, Siberian Division, USSR Academy of Sciences, Novosibirsk; All-Union Scientific Research Institute for Chemical Means of Plant Protection, Moscow

[Abstract] Previous research has determined that the Pribnov, or "10" sequence, is involved in permanent bonding, and the Schaller, or "35", sequence relates to recognition in the process of the reaction of DNA-dependent RNA-polymerase with the activating area of a gene. The authors sought to obtain more specific information about this phenomenon by assessing the capacity of E. coli and T7 bacteriophage RNA-polymerase to bind synthetic oligodesoxynucleotides of more than 9 links. Results showed that the RNA-polymerase of the Pribnov sequence bonded 200-300 times more intensively than that of the Schaller sequence. Species-specific selectivity was clearly established, and functional differences were noted within the homologous area of the genes of phage T7. The identification function of the Schaller sequence was also confirmed. Figures 2; references 10: 2 Russian, 8 Western.  
[570-12131]

# ARTIFICIAL INTERFERON GENE

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 7, Jul 83 pp 35-41

KOLOSOV, M.N., Academician

[Abstract] A brief description is provided of the principles of genetic engineering underlying the creations of an artificial gene coding for the synthesis of  $\alpha 2$ -interferon, and its subsequent expression via a vector mechanism in E. coli. This represents the first successful Soviet endeavour in this direction and marks the completion in the Fall of 1982 of the "Artificial Interferon Gene" program of the USSR Academy of Sciences. Current emphasis is placed on improving the level of expression of this gene by synthesizing more efficient promoters and initiators, leader sequences to enhance metabolic stability of mRNA, as well as signal sequences which would prevent interferon degradation by cellular proteinases. Search is also underway for microorganisms other than E. coli to serve as hosts and amplify the artificial interferon gene.  
[607-12172]

UDC: 615.371.579.841.11

PROTECTIVE EFFECTIVENESS OF BACTERIAL ANTIGEN CONJUGATES WITH SYNTHETIC POLYELECTROLYTES

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 270, No 5, Jun 83 (manuscript received 20 Jan 83) pp 1257-1259

PETROV, R.V., academician, USSR Academy of Medical Sciences, KABANOV, V.A., corresponding member USSR Academy of Sciences, KHAITOV, R.M., NEKRASOV, A.V., ALEKSEYEVA, N.Yu., APARIN, P.G. and YELKINA, S.I., Second Moscow State Medical Institute imeni N. I. Pirogov, Moscow

[Abstract] A study was made of the capability of polysaccharide conjugates with synthetic polymer adjuvants to produce a vaccinating effect, forming acquired resistance to *Salmonella typhimurium* infection. Hybrid mice were used in the experiments. O-antigen was extracted from *Salmonella typhimurium* strain 415. The polysaccharide was obtained from the O antigen by acid hydrolysis with 0.5% CH<sub>3</sub>COOH. The synthetic polymers used as carriers were polyacrylic acid with molecular mass 80,000 and a modified copolymer of acrylic acid and N-vinylpyrrolidone of equimolar composition, molecular mass 100,000. It was found that the protective properties of the polysaccharide increased sharply upon conjugation with synthetic polymers. Conjugation of PS with MNS resulted in an increase in the protective activity by an average factor of 10.5. In the complex conjugate, the protective effectiveness increased by a factor of 9.1. The results of the experiments thus showed that conjugation of bacterial polysaccharide, with no manifest protective properties, with synthetic polymer adjuvants increased the protective activity by an order of magnitude. Figure 1; references 11: 5 Russian, 6 Western. [569-6508]

UDC: 615.272:547.962.5].03:616=006.6

USE OF TOXIC PLANT LECTINS IN THE IMMUNOTOXINS (AFFINOTOXINS)

Moscow ZHURNAL MIKROBIOLOGII EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 5, May 83 (manuscript received 9 Nov 82) pp 18-25

FRANZ, H. and PFULLER, K., Institute of Immune Preparations and Nutrient Media, Berlin

[Abstract] Plant lectins (ricin, abrin, modescin, ML1) can be used in the preparation of immunotoxins. The authors have previously published a review

of their properties and capabilities for use. In the present review, they discuss the isolation, structure, properties, mechanism of toxinaction and modern aspects of application of these lectins. Separation and purification of toxic lectins are usually performed by extraction in a common salt solution with a phosphate buffer and centrifugation. The centrifuged residue is dissolved in water and dialyzed several times. The remaining yellowish solution contains the lectins which are usually isolated by means of chromatography. The molecular structure and properties of toxic lectins are discussed. They contain a single A chain and one B chain connected by a disulfide bridge. The molecular mass of each A-B unit is 55,000-60,000. The mechanism of action of the toxin is by bonding with the cell membrane through the B chain allowing the A chain to pass through the membrane into the cytosol. The A chain then inactivates approximately 500 ribosomes per minute, causing irreversible cell damage. The basis is inhibition of protein synthesis caused by enzymatic damage. Possible applications result from the fact that various cell lines differ significantly in their sensitivity to plant lectins, and that tumor cells have been found to be particularly highly sensitive to them. Figure 1; references 68 (Western).  
[721-6508]

UDC: 616.98:579.841.94]-07:616.153.963.4-097

#### STUDY OF IgG SUBCLASSES IN CHRONIC BRUCELLOSIS PATIENTS

Moscow ZHURNAL MIKROBIOLOGII EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 5, May 83 (manuscript received 10 Aug 82) pp 75-78

KICHIYEVA, B.N., CHERNYSHEVA, M.I. and ZHELUDKOV, M.M., Dagestan Medical Institute, Makhachkala; Institute of Epidemiology and Microbiology imeni N.F. Gamaleya, USSR Academy of Medical Sciences, Moscow

[Abstract] The purpose of this article was to determine whether there are disorders in protein synthesis of IgG subclasses in brucellosis patients. Studies were performed on 52 chronic brucellosis patients who had the disease for 1 to 10 years. Ten of the subjects were examined before and after specific antigen therapy. The levels of immunoglobulins and IgG subclasses were determined from the indices of the pool of blood sera of 3000 donors titrated according to WHO standards. The level of IgM in the 42 patients studied for this protein was within the normal limits. IgA was sharply reduced, and there was some reduction in total IgG. The concentrations of G<sub>1</sub>, G<sub>2</sub> and G<sub>4</sub> were within the normal limits, that of G<sub>3</sub> was elevated. Some correlation was observed between the increase in IgG<sub>1</sub> level and presence of specific antibodies resistant to 2ME (IgG). [2ME = 2-mercaptoethanol]. A relationship between specific antibody synthesis and IgG<sub>3</sub> level was not established. References 15: 9 Russian, 6 Western.  
[721-6508]

## ALMIGHTY MACROPHAGES

Moscow PRIRODA in Russian No 9, Sep 82 pp 21-28

GALAKTIONOV, V.G., Institute of Immunology, USSR Academy of Medical Sciences

[Abstract] A description is provided in popular terms of the role of macrophages in host defense mechanisms, after a period of some neglect in recent immunological investigations. After the initial discovery of the phagocytic role of macrophages by I.I. Mechnikov and the early controversies on the relative importance of humoral immunity and phagocytosis, interest in macrophages was eclipsed by advances in other areas of immunity. It was not until the late sixties that the significance and role of macrophages in both humoral and cell-mediated immunity became apparent, as well as its role in T and B cell cooperation. In addition to the role of the macrophage in the formation of the specific immune response, these cells are also involved in the multiplication of hematopoietic cells, in thymocyte differentiation, T cell maturation, effecting graft-versus-host reactions, hepatoma destruction, etc. This recitation of some of the functions of the macrophage indicates that this cell will remain a center of attraction of biologists for some time to come, despite the delay in recognition of its pluripotential character. Figures 4; references 6: 2 Russian, 3 Western.  
[611-12172]

## MARINE MAMMALS

### RELIABLE SHOULDER OF PERSEUS

Moscow MOSCOW NEWS in English No 26, 3-10 Jul 83 p 9

[Article by Yuri Andreotti]

[Text] I have been acquainted with the "magnificent eight" since 1974 when I took part in catching them near the Crimean shores. Already then I was astonished at seeing how the dolphins stuck together. When we lifted them on board the ship, one of the dolphins slipped from our hands but he did not flee, as if waiting for something and continuing to swim nearby. It turned out he had been waiting for a friend of his who also managed to slip away. Only then did the two dolphins take to the high seas. I happened to watch two other dolphins keep a third, sick one, afloat for a whole week.

The eight of them were taken to Batumi, the capital of the Adzhar Autonomous Republic, where it was decided to build an exhibition dolphin aquarium.

Eight Black Sea dolphins, headed by the herd leader Perseus, give several forty-minute shows a day. It doesn't appear that the dolphins feel any dissatisfaction because of this high performance rate. On the contrary, they seem to feel idle when there are no people about for a long time.

When the trainer, Goga Iosava, gives the signal, the dolphins dart to him, stand up high in the water, and then half-lie on the wooden platform. The "volleyball" game begins: rubber balls fly in the air and each dolphin, kicking it with its nose, returns the ball into the man's hands. A jackfish is the remuneration which the dolphin very gracefully catches in mid-air. Now the rings. Perseus tries to put two, and sometimes three, rings in a row on his nose. Being a clever guy, he understands that this is the way to get more fish.

Dolphins may become man's reliable helpers in the sea, and this is something Perseus demonstrates very clearly. When Iosava goes down into the water, Perseus props him up with his fin so that they are able to make several swift rounds in the reservoir together. In the next act, he puts his nose through a ring which is tied to a boat and pulls around the man in the boat.

These surprisingly graceful animals demonstrate top-grade simultaneous action in the triple jump through hanging rings. The reservoir literally

teems with excitement when their 300 kg bodies reenter the water. The dolphins pop up into the air with the precision of a pendulum and return to their medium with the same exactitude.

Perseus is again the record performer, soaring vertically four and a half meters in the air to snatch a fish out of the trainer's hand.

When meeting the dolphins for the first time, I exercised some precaution. Their tails' blow can kill a shark, while almost eighty 2-cm-long teeth can break a thick stick instantly. But they have never once exhibited any hostility towards man. They may be our best friends in the depths of the Black Sea.

CSO: 1840/569



## MEDICINE

### PROTON SCALPEL

Moscow PRAVDA in Russian 24 Jul 83 p 3

[Article by A. Gorokhov: "Proton Scalpel--Next to the Researcher"]

[Text] Two proton beam channels with two treatment offices have been put in operation at the Institute of Theoretical and Experimental Physics (ITEP) of the USSR State Committee for Use of Atomic Energy, on the basis of a proton synchrotron. Together with the external proton beam channel and multi-purpose treatment office for oncological patients, this "attachment" to the accelerator constitutes a three-chamber ["cabin"] biomedical complex. There, second generation radiation stands will treat both oncological and other patients.

... I spoke with V. Khoroshkov, candidate of engineering sciences and laboratory head, right in the treatment room. The end of a proton line protruded meaningfully from one of the walls. Before it was a stand for irradiation of intracranial targets and, next to it, another one, that is adjustable, on which the patient will be placed with extreme precision: the protons must hit the target exactly.

It was quiet in the treatment room, one could say boring.

Nothing indicated the fact that an accelerator was operating at full speed behind the wall. There, a routine physical experiment was in progress.

But soon everything changed. We were called to the control [console] room. Only a few minutes remained before the next patient arrived; the proton beam, or more precisely the part of it that was "selected" for the treatment by physicists, had to be tested.

Andrey Runkov, who was to make this test, has an appropriate job title: proton beam operator, which was inconceivable 23 years ago, when he was born. Andrey moved a few tumblers. Numerous telemonitors that check segments of the proton line lit up one after the other. The radiation, as it passes through special targets installed over the tract, elicited fluorescence [luminescence]. There they are, the protons!

The operator is pleased with the beam--parameters are OK and the treatment can begin. Moreover, Yelizaveta Il'inichna Minakova, neuroradiologist from one of the institutes in Moscow, is already there at the synchrotron. She has brought a patient with a complicated disease....

But why protons? After all, soon after the French physicist, Antoine Becquerel, discovered radioactivity at the end of the 19th century, the biological effects of ionizing radiation on man were also discovered. Even then, radiation from radium was first used for therapeutic purposes, and so were x-rays, that had just been discovered, which were subsequently renamed after their discoverer, Wilhelm Roentgen.

"Progress in radiation therapy over a period of almost 100 years of its existence, amounted essentially to one thing: search for possibility of selectively attacking populations of neoplastic cells, while sparing healthy tissues, organs and cells," said V. Khoroshkov. "There is the concept of dose field, in other words, the distribution of absorbed energy in an irradiated body. It was found that the dose fields of charged particles, in particular protons, have several advantages in this sense. They give off virtually all of their energy at the end of their range, at the so-called Bragg peak, i.e., at a certain depth in the human body, unlike gamma rays, x-radiation or electrons. Moreover, the proton beams can be "focused" precisely and there is minimal scatter of particles in tissues. In brief, it became possible to create a high concentration of absorbed radiation energy in a pathological site, to obtain drastic dose gradients on the boundary between a tumor and healthy tissue."

"But the idea of using heavy charged particles for radiation therapy was advanced right after the war, I interrupted Vladimir Sergeyevich. "What took so long to implement it?"

"Where were we to get these heavy particles?", questioned the laboratory head in response. "In those days there were no accelerators. And it took about 20 years for our predecessors to demonstrate the unique properties of protons...."

This is what I was told. In 1966, Academician I. Pomeranchuk, one of the founders of the ITEP, posed the following question to Prof A. Ruderman, in whose department at the Institute of Experimental and Clinical Oncology (presently the All-Union Oncological Science Center (AUOC) the physicist was treated:

"Why are you exposing patients here to gamma rays and not to protons as, for example, our ITEP?"

I assume that the death of this very famous scientist became the last straw; however, soon after this the problem of proton therapy was tackled on the very highest level. The idea was supported, and vigorously at that, by administrators of venerable groups: AUOC, ITEP and Laboratory of Nuclear Problems in Dubna. We refer to Academicians N. Blokhin, A. Alikhanov, and Corresponding Member of the USSR Academy of Sciences, B. Dzhelepov.

Already in April of 1967, the scientists in Dubna together with oncologists developed on their synchrocyclotron a medical proton beam and constructed a clinicophysical research complex. By that time, the knowhow abroad, in the United States and Sweden, in direct irradiation of tumors with proton beams was limited to only a few dozen cases. That same year, the physicists at ITEP also made their first advance, having developed "their own" beam, and later on the Leningrad Institute of Nuclear Physics joined in this work, in collaboration with the Central Scientific Research Institute of Roentgenology and Radiology, USSR Ministry of Health.

Such a wide "offensive" soon advanced the Soviet Union among world leaders. Suffice it to mention that it is expressly with the attachment to the Moscow synchrotron, from which we are reporting, that 20% of all those irradiated on our planet underwent proton treatment. Clinicians from six prominent medical centers in the capital are working with the ITEP beam.

The Institute of High-Energy Physics (Serpukhov) and Tensor Instrument Plant (Dubna) designed and built the equipment for the new synchrotron "attachment." A considerable share of the electronic work was done by specialists at the Institute of Electronics and Computer Engineering of the Latvian Academy of Sciences. The principal component of this equipment is referable to second generation radiation stands. The 15-years of experience in working with the ITEP beam was applied to them. Formation and choice of dose fields, "adjustment" of the patient's position are jobs for the computer. The compartment [cabin] specialization is as follows: one for intracranial interventions, another for irradiation of targets in the chest and eyes, the third for irradiation of the lower part of the body. The stands were built on this basis, and the proton beams were "separated" (in the physicists' words, transport of ionizing radiation), monitoring and control were automated.

The three-compartment "attachment" to the institute's accelerator became a self-styled model for the special biomedical complex that is currently being developed.

"An important part of the plan has been completed--comprehensive technical and economical validation," stated Prof I. Chuvilo, doctor of physico-mathematical sciences, director of the ITEP. "The time has come for working plans and erection of the complex. Why did this become necessary? In our country--at the ITEP, Laboratory of Nuclear Problems of the Joint Institute of Nuclear Research in Dubna, Leningrad Institute of Nuclear Physics in Gatchina--in Sweden and the United States, biomedical research and clinical work were and are pursued with accelerators that are intended primarily for physical experiments and only adapted "for medicine." The knowhow gained in proton therapy and diagnostics compelled one to think about expanding significantly the use of these beams in clinical practice. This could be done only with a specialized multichannel complex equipped with its own accelerator."

[Question] Consequently, a new term appeared, medical proton accelerator. What are its distinctions?

[Answer] "Such a unit must irradiate targets of any size located in any part of the human body," joins in L. Gol'din, doctor of physicomathematical sciences. "It has another task, to generate radionuclides that are needed for diagnostic purposes."

[Question] What is the approximate cost of such a complex?

"According to our estimates, about 30 million rubles," estimates I. Chuvilo. "The personnel for it will constitute 200-250 people. I should like to caution against one rather widespread confusion. The bulk of the cost of the complex is referable to special medical equipment, rather than the accelerator, which will be a rather small piece of machinery. We are dealing not only with already existing apparatus. We need devices that have yet to be developed and tested. Probably many of them will turn out to be useful, not only for proton therapy but in other branches of medicine...."

Let me fill in on what the specialists told me. They expect to give up to 100 radiation procedures per day, therapeutic and diagnostic, using 6 channels of an external proton beam. This task can be performed only with the utmost degree of automation. For example, it is necessary to form immediately the individual dose fields, or else take "prepared ones" from a bank of previously formed ones, to switch the beam from one channel to another; in brief, accelerator time must be used efficiently.

... It so happened that at the time we were leaving the ITEP premises, an ambulance approached in the driveway, delivering a patient for a routine treatment. The thought went through my head that physicists, together with physicians, are pursuing a very difficult but promising and necessary search.

For most people living on earth, nuclear physics is abstract and incomprehensible, and once more it is turning toward man its exclusively humane side.

10,657

CSO: 1840/567

## DYNAMICS OF MORPHOLOGIC CHANGES IN A BURN WOUND DURING TREATMENT IN A CONTROLLED ABACTERIAL MEDIUM

Moscow BYULLETEN' EKSPERIMENTAL'NOY BIOLOGII I MEDITSINY in Russian No 4, Apr 82 (manuscript received 22 Dec 81) pp 108-111

SOLOGUB, V.K., TUMANOV, V.P., MUZYKANT, L.I. and YAKOVLEV, G.B., All-Union Burn Center (headed by Professor V. K. Sologub), and Laboratory of Histochemistry and Autoradiography (headed by Doctor of Medical Sciences V. P. Tumanov), Institute of Surgery imeni A. V. Vishnevskiy, USSR Academy of Medical Sciences, Moscow

[Abstract] A study was made of the dynamics of healing of burns using biopsy materials as a function of the methods of treatment used, dressed and open. The morphology of burn wounds was studied in a controlled abacterial medium on 30 burn patients with 3rd and 4th degree burns over 25 to 50% of the body surface. Most of the deep burn wound areas were closed surgically 15 to 20 days after trauma. The biopsy material was taken 5 to 10 days after beginning of treatment. The control group consisted of 10 patients of the same age group with burns of identical area and depth who were treated by application of bandages. Treatment of the wounds of these patients by multistage necrectomy was 25 to 32 days. Biopsies were performed between the 12th and 30th days after the beginning of treatment. The morphologic and histochemical studies of biopsates showed significant differences in the nature of healing of the wounds. Granulation occurring under the bandages particularly in the early stages of treatment was quite reminiscent of the granulation formed upon slow healing of gunshot wounds and long-term trophic ulcers. Large numbers of plasma cells in the tissues were present in all these wounds. The granulation observed in the burns treated in the abacterial medium were rich in vessels and cell elements very early in treatment (5-6 days) and similar to the granulation tissue formed during healing of surgical wounds. The low microbe population of such wounds and frequent inflammation resulted in low plasma cell content in the granulation, creating favorable conditions for healing of autotransplantates. Wounds treated in a controlled abacterial medium healed 10 to 12 days faster than those wrapped in bandages. Photomicrographs are presented. Figures 4; references 6 (Russian). [258-6508]

PROTEASE INHIBITORS BLOCK DISSEMINATION OF INFLUENZA VIRUS TO ORGANISMS OF  
INFECTED ANIMALS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 270, No 6, Jun 83 (manuscript  
received 24 Oct 82) pp 1483-1485

ZHIRNOV, O.P., OVCHARENKO, A.V. and BUKRINSKAYA, A.G. and ZHDANOV, V.M., member  
of the USSR Academy of Medical Sciences, Institute of Virology imeni  
D.I. Ivanovskiy, USSR Academy of Medical Sciences, Moscow

[Abstract] The basic virus glycoprotein, hemagglutinin, exists both as a continuous polypeptide with molecular mass of 75,000 daltons and in a split form with a disulfide bond, one part with molecular mass of 50,000 and the other with 25,000 daltons. The split form, which is caused by proteases that activate the virus during the fission, is the more infectious. The authors infected two-day-old chicks with either German chick virus/49 or California turkey virus/71 intranasally, then administered protease inhibitors epsilon-amino-eta-caproic acid ( $\epsilon$ -AKK) or aprotinin [Kontrikal, GDR] every 3-6 hours for 3 days. Whereas a control group (without inhibitors) was found to have influenza virus throughout their bodies after 3 days, the chicks given  $\epsilon$ -AKK had only lung infections, while some showed no influenza virus at all. In a second series of tests, inhibitors were given 72 hours after initial infection. Results for both test and control groups after the sixth day were similar. The  $\epsilon$ -AKK inhibitor was considered to prevent fission of the hemagglutinin, thus preserving the less contagious continuous form. References 15: 3 Russian, 12 Western.  
[570-12131]

UDC: 616.98:679.841.93]-092:616-008.939.624-097-078.73

AUTOANTIBODY FORMATION IN BRUCELLOSIS

Moscow ZHURNAL MIKROBIOLOGII EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 4,  
Apr 83 (manuscript received 22 Jun 82) pp 92-95

TIKHENKO, N.I., TARAN, I.F. and NURMAGOMEDOV, M.N., Scientific Research  
Antiplague Institute of the Caucasus and Transcaucasus, Stavropol

[Abstract] A study was made of the activity of autoantibody formation against various organs and tissues in guinea pigs infected with various species of

brucellosis pathogen. The experiments involved 320 guinea pigs divided into four groups: a control group and animals infested with virulent cultures of *Brucella abortus* 544, *B. melitensis* 565 and *B. suis* 1330, dose  $10^3$  microbe cells subcutaneously. Ten individuals from each group were studied after 15, 30, 45, 60, 75, 90, 120 and 180 days following infection. A significant increase in autoantibody titer for spleen tissue and lymph nodes was observed. The maximum titers were observed 2 to 2 1/2 months after infection. Specific agglutinins were observed in maximum titers one month earlier than autoantibodies. The lack of any increase in autoantibodies for the tissues of the heart and liver indicate that in brucellosis the spleen and lymph nodes are primarily involved in the pathologic process. Figure 1; references 15 (Russian).  
[720-6508]

UDC: 579.842.11:579.252.55].083.13

#### METHOD OF SELECTION OF AEROSOLIZATION RESISTANT AND SENSITIVE ESCHERICHIA COLI

Moscow ZHURNAL MIKROBIOLOGII EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 4, Apr 83 (manuscript received 2 Nov 81) pp 14-17

KONYUKHOV, V.F., LIKHODED, L.Ya. and SADRETDINOV, S.M., Institute of Epidemiology and Microbiology imeni M. F. Gamaleya, USSR Academy of Medical Sciences, Moscow

[Abstract] In recent years investigators have begun to study the genetic factors responsible for bacteria which survive aerosol sprays. Previous articles have suggested similarity of the mechanism of death of microbe cells exposed to aerosol and lyophilized cells. This information served as the basis for development of a method of selecting *E. coli* resistant and sensitive to aerosols based on selection of bacteria resistant to lyophilization. Differences in survival rates of two orders of magnitude were observed between strains with varying sensitivity to aerosol treatment. The method is based on storage of lyophilized cultures in moist air. The method was used to select aerosol-resistant strains of *E. coli* obtained upon transmission of the plasmid pS A50 from donor to recipient. References 8: 4 Russian, 4 Western.  
[720-6508]

#### SCIENTIFIC INTERCHANGE AMONG MICROBIOLOGISTS AND VIROLOGISTS OF THE REPUBLIC

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 3, Mar 83 pp 65-68

KUKAYN, R.A., BEKER, M.Ye. and YAKOBSON, Yu.O.

[Abstract] The Institute of Microbiology imeni Avgust Kirkhenshteyn, Latvian SSR Academy of Sciences, is the experimental plant for biochemical preparations in the Latvian SSR, a leading scientific research organization in the area of

microbiology, virology and biotechnology. Studies in these areas and work on the creation of hardware and control systems for fermentation processes performed at the Institute have led to the creation of a number of original devices, the development of the theory of the technological processes of extracellular concentrates. The results of the work of microbiologists and virologists have always been largely determined by their scientific communications. This tradition has been preserved and developed by the scientific school of A. M. Kirkhenshteyn at the Latvian University. An example of the fruitfulness of multilateral cooperation is the studies in the area of virology, epidemiology and immunology of poliomyelitis begun in 1955, resulting in the nation's first massive immunization of the population with live attenuated polio vaccine. Cooperation of the Institute of Microbiology with the Institute of Biochemistry imeni A. N. Bakh, USSR Academy of Sciences and other institutes resulted in the creation of an original industrial method of production of lysine feed concentrate. Cooperation of the Institute with other organizations includes its participation in the development of plans and programs, the conclusion of agreements for scientific cooperation by organization of various conferences, symposia and schools for young specialists. The Institute participates in the development of a number of national and international programs on such subjects as interferon, transformation of photosynthesis products and others. The Institute cooperates with the Institute of Organic Synthesis, Latvian SSR Academy of Sciences and others in studies of antiviral substances and their mechanisms of action. All of these represent but a small fraction of the extensive scientific contacts of the Institute directed toward combined study of important problems and acceleration of the introduction of the results of these studies to practice.  
[531-6508]

#### SPECIFICS OF MICROBIOLOGIC CONCENTRATES AND DEWATERING TECHNOLOGIES

Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 3, Mar 83 pp 108-116

LAUKEVITS, Ya.Ya. and VIYESTUR, U.E.

[Abstract] This report, read by U. E. Viyestur at a session of the Presidium of the Latvian SSR Academy of Sciences on 20 January 1983, discusses microbiological concentrates containing large quantities of low-molecular-weight substances not contained in the cells of microorganisms. These substances may be extracellular metabolites, nutrient-medium component residues, additives, stabilizing enzymes which do not crystallize upon dewatering, etc. The great hygroscopicity and thermoplasticity of the concentrates cause technical difficulties in production practice, though crystallization of the end products can be achieved after complex purification operations and the components removed in purification are frequently effective in themselves, retaining the specific properties of the concentrates. For biopolymer preparations such as purified enzymes it is still more difficult to achieve crystalline form, though this group of preparations usually has satisfactory technological properties. The main results presented in this work were obtained by staff personnel at the Institute of Microbiology imeni Avgust Kirkhenshteyn, begun



in 1971. The essence of the concepts which have been developed are as follows: hygroscopicity and thermoplasticity of concentrates result primarily from the presence of low molecular weight, water-soluble substances outside the cells of the microorganisms. These substances when dried are primarily amorphous rather than crystalline; powders of these amorphous substances can be stable only at temperatures below the glass point; above the glass point the viscosity of the preparations is extremely low so that merging of particles occurs rapidly; the low molecular weight, water-soluble substances bond water from the atmosphere by hydration of molecules and ions, leading to a great decrease in viscosity of the preparation; throughout the entire preparation-water-system the glass point decreases from the glass point of the absolutely dry substance to the glass point of water,  $135\pm K$  ( $-135^{\circ}C$ ); this combination of properties means that concentrates in equilibrium with extracellular low molecular weight, water-soluble substances under ordinary climatic conditions are always in the melted state, viscous pastes or fluids, their powder form being unstable; finally, preparations containing components which collect moisture by various mechanisms are influenced to a decisive degree by the low molecular weight, water-soluble substances which are frequently the dispersing medium for the remaining components.

[531-6508]

UDC 579.84:577.112'114'314.6

#### LIPOPOLYSACCHARIDE-PROTEIN COMPLEXES OF EXTERNAL MEMBRANE OF GRAM NEGATIVE BACTERIA

Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 9, No 6, Jun 83 (manuscript received 5 May 82; in revised form 29 Sep 82) pp 725-733

SOLOV'YEVA, T.V. and OVODOV, Yu.S., Pacific Ocean Institute of Bioorganic Chemistry, Far Eastern Scientific Center, USSR Academy of Sciences, Vladivostok

[Abstract] A survey of largely Western literature is provided on the lipopolysaccharide-protein complexes (LPSP) of the external membrane of Gram-negative bacteria. Recent advances in the understanding of the chemical and structural features of the LPSP complexes, their function at potent mitogens for the B cells, and their long-recognized role as endotoxins and O-antigens are emphasized. Coverage is also given to newer information on the molecular organization of the Gram-negative cell wall, methods of isolation of the LPSP complexes, as well as an indication on the need for more information on the functional role of the LPSP complexes in bacterial physiology. Figures 2; references 70: 5 Russian, 65 Western.

[610-12172]

UDC: 615.916'174.5.057.07:616.15-07

CHARACTERISTICS OF THE BLOOD SYSTEM RESPONSE OF PEOPLE WITH ACUTE NICKEL CARBONYL POISONING FOLLOWING SYSTEMATIC EXPOSURE TO SMALL CONCENTRATIONS OF THIS SUBSTANCE UNDER MODERN INDUSTRIAL CONDITIONS

Moscow GIGIYENA TRUDA I PROFESSIONAL'NYYE ZABOLEVANIYA in Russian No 2, 1979 (manuscript received 19 Jun 78) pp 20-22

[Article by N. V. Revnova (Leningrad), Institute of Hygiene of Labor and Occupational Diseases]

[Text] One of the methods of obtaining pure nickel is based on extracting it from nickel-containing raw material by means of a reaction with carbon monoxide. With this technological process, a highly toxic intermediate product, nickel tetracarbonyl, is released into the air of work premises, and exposure to high concentrations could cause serious, acute poisoning (I. V. Sanotskiy; S. N. Sorinson).

It has been determined that chronic poisoning and toxic pneumosclerosis can develop (V. A. Vasil'yeva et al.) with long-term exposure to nickel carbonyl in concentrations inherent in modern industry (hundredths or thousandths of a milligram per cubic meter, the maximum permissible concentration being  $0.0005 \text{ mg/m}^3$ ).

Dynamic observation of a stable group of workers referable to the basic occupations involved in nickel production by the carbonyl method (the same 160 individuals were checked annually for the first 10 years after the shop was started up), who had been exposed to nickel carbonyl in the above concentrations, revealed phasic changes in peripheral blood composition. Of special interest is the first phase, the nature of changes in which was indicative of increased regeneration of erythrocytes (slight increase in erythrocyte count and hemoglobin, reticulocytosis, increase in average volume and diameter of erythrocytes, right shift of acidity erythrogram). The maximum regenerative changes occurred within the first 2-4 years of work, when most workers were essentially in good health. Subsequently, the red cell indicator reverted to normal, but in a small number of the workers there was moderate anemia.

Concurrently with changes in erythrocyte composition of blood, there were fluctuations of leukocyte count, manifested by an initial increase (1st-3d years of work) and subsequent development of a tendency toward leukopenia, which progressed in some cases with increase in work tenure. Maximum

decline of leukocyte count was observed in the 3d-5th years of working with nickel carbonyl. Concurrently with the initial rise in total leukocyte count, one could observe a wide scatter of eosinophil count, ranging from distinct eosinophilia to eosinopenia, as well as a tendency toward lymphopenia. These changes were inherent expressly in the early stage of contact with nickel carbonyl, and they leveled off as leukopenia increased.

As shown by observations of other occupational groups, when there is contact with various toxic agents and physical factors, the above-mentioned initial hematological reaction is etiologically nonspecific, and it is related to adaptive processes. The indicated changes in composition of blood reached a maximum in workers who subsequently contracted chronic occupational diseases. Thus, the intensive initial hematological response at the early stage of contact with a deleterious industrial factor is indicative of a high risk of occupational disease. For example, in the case of exposure to nickel carbonyl, a distinct reticulocyte reaction was demonstrated in the first 2-4 years of work in individuals in whom the diagnosis of chronic poisoning was subsequently established. This reaction was moderate or absent in individuals who remained in good health for the first 10 years.

These data indicate that the severity of the initial hematological response yields some information for forecasting development of chronic poisoning, long before appearance of its main clinical manifestations, of which the leading ones are functional nervous system disturbances and toxic involvement of the lungs (toxic pneumosclerosis).

On the basis of the foregoing, the initial nonspecific hematological reaction should be interpreted as a manifestation of prepathology, and its onset in people working under adverse conditions should serve as an indication for individual preventive agents and optimization of working conditions.

As we have indicated above, in individuals burdened with various general somatic diseases, the nature of the initial hematological response is somewhat different from the one who came on the job in good health. It was of great practical interest to determine how acute occupational nickel carbonyl poisoning, which is still encountered in emergency situations in nickel production by the carbonyl method, affects the nature of the initial hematological reaction.

Over the 10-year period of observation of workers in the nickel production shop, from the time it was started up for regular operation, several individuals sustained acute nickel carbonyl poisoning which varied in severity. Of this number, 16 people continued to work in their former occupation after they recovered (from mild and moderate poisoning). Thus, we have the results of annual blood tests on these workers for 5-7 years after acute poisoning. The minimum interval between acute poisoning and the first test was 3 months and maximum 9 months.

Analysis of the results revealed that the initial response of the blood system of individuals who had suffered acute poisoning differed from the reaction of essentially healthy workers. We were impressed by the fact that, from the

very first months after acute intoxication, the number of reticulocytes steadily decreased, during which their average level in those with acute intoxication was lower than the level in all the other workers (these are people with developing chronic nickel-carbonyl intoxication, toxic pneumosclerosis and healthy workers). Also, the workers suffering acute intoxication did not exhibit other signs of increased erythrocyte regeneration: tendencies towards macrocytosis, increased acidity resistance, which occurred in the initial period of work with nickel carbonyl by practically healthy people.

A stable decline of leukocyte level and phagocytic activity of neutrophils was observed after recovering from acute nickel carbonyl poisoning, whereas these changes were transient in essentially healthy workers. We did not observe appreciable fluctuations of absolute eosinophil and lymphocyte count, which were typical of the early stage of work in essentially healthy workers, in those who had sustained acute poisoning.

The submitted data indicate that acute nickel carbonyl poisoning in individuals who are regularly exposed to relatively low concentrations of this agent under industrial conditions alters the nature of the hematological response to start of contact with it. Consequently, the nature of the initial reaction of the blood system depends on the initial state of hemopoiesis.

Hence the importance of keeping records of cases of mild acute intoxication, which sometimes occur under the guise of acute respiratory disease. By attenuating the initial hematological response, acute poisoning obscures the symptoms of habituation, which are indicative of inconsistency between levels of concentrations of the toxic agent and the worker's resistance to it, as well as of the need to take steps for individual and group protection.

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CSO: 8144/1695

STUDY OF THE POISON OF RENARD'S VIPER VIPERA URSINI RENARDI CH.: PART 5:  
PHOSPHOLIPASE A<sub>2</sub> WITH ANTICOAGULANT PROPERTIES

Tashkent KHIMIYA PRIRODNYKH SOVEDINENIY in Russian No 3, May-Jun 83 (manuscript received 18 Jan 83) pp 399-400

LYUBIMTSEVA, G.Ye. and YUKEL'SON, L.Ya., Institute of Biochemistry, Uzbek Academy of Sciences, Tashkent

[Abstract] An estimate is made of the anticoagulant effect of two A<sub>2</sub> phospholipases obtained in pure form from the poison of Renard's viper. Human donor blood citrate plasma was used to measure the recalcification time after introduction of the tested material diluted with a saline solution. Saline solution alone was used in control experiments. A bar graph illustrates the dose dependence of anti-coagulant activity of III-3 A<sub>2</sub> phospholipase. III-2 A<sub>2</sub> phospholipase from the same poison had no anticoagulant effects. Figure 1; references 6: 2 Russian, 4 Western.  
[567-6508]

UDC: 577.11

LOW MOLECULAR WEIGHT CHANNEL FORMING COMPONENT OF NEUROTOXINS IN THERIDIIDAE  
FAMILY SPIDER POISONS

Tashkent KHIMIYA PRIRODNYKH SOVEDINENIY in Russian No 3, May-Jun 83 (manuscript received 26 Jan 83) pp 400-401

USMANOV, P.B., KAZAKOV, I., KALIKULOV, D., ATAKHUZIYEV, B.U., YUKEL'SON, L.Ya. and TASHMUKHAMEDOV, B.A., Institute of Biochemistry, Uzbek Academy of Sciences, Tashkent

[Abstract] A study was made of the poison of Lityphantes paukullianus of the family Theridiidae. To determine the components causing presynaptic and channel-forming effects, the poison was separated on G-100 sephadex into four fractions. Testing on preparations of the synapses of vertebrates and insects showed that fraction I, 100,000 daltons and higher, increased channel forming frequency and had presynaptic effects only on vertebrates, whereas fraction III, 30,000-40,000 daltons, had a similar effect only on insects. All fractions increased the integral conductivity of bilayer membranes and formed channels with identical ionic selectivity and similar amplitude. Identical results were obtained in studies of the poison of the spider Latrodectus mactans. In spite of the fact that the two spiders belong to different genera in the family Theridiidae, their poisons have similar active ingredients--low molecular weight channel-forming components. The structure of the presynaptic neurotoxins in the two poisons consists of high molecular weight promoters having a selective effect on the presynaptic membrane of synapses of either vertebrates or insects and a low molecular peptide acting as a channel former. References 5: 1 Russian, 4 Western.  
[567-6508]

## SELECTIVE TOXICITY AS A CRITERION FOR SELECTING PROMISING INSECTICIDES FOR MEDICAL DISINFECTION

Moscow MEDITSINSKAYA PARAZIOTOLOGIYA I PARAZITARNYYE BOLEZNI in Russian No 3, May-Jun 83 (manuscript received 18 Dec 81) pp 64-69

GLEYSBERMAN, S.Ye., DREMOVA, V.P. and TSETLIN, V.M., All-Union Scientific Research Institute of Disinfection and Sterilization, USSR Ministry of Health, Moscow

[Abstract] An analysis of the selective toxicity factor  $K_{st}$  as calculated by the authors for pesticides in various chemical groups including chlorinated organic compounds, organophosphorus compounds, carbamates, synthetic pyrethroids, for two species of mammals (white mice and rats) and four species of insects which are objects of medical disinfection (house flies, cockroaches, bed bugs and body lice). The LD<sub>50</sub> of most preparations for the insects and mammals were determined at the authors' institute and also taken from several previous publications.  $K_{st}$  of the pesticides is an integral characteristic of the selectivity of their toxic effect for species compared (mammals and insects in this case) at the mean lethal dose level. Quantitative evaluation of the selective toxicity of pesticides based on  $K_{st}$  provide some prognostic information which should be used for primary selection of promising insecticides. References 17: 14 Russian, 3 Western. [717-6508]

UDC 577.15/.17

## PHYSICOCHEMICAL APPROACH TO BIOLOGICALLY ACTIVE SUBSTANCES WITH DEFINED STRUCTURE-ACTIVITY RELATIONSHIPS

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 7, Jul 83 pp 93-101

MARTYNOV, I.V., corresponding member, USSR Academy of Sciences, and RAYEVSKIY, O.A., doctor of chemical sciences

[Abstract] Consideration is given to the practical and philosophical aspects to the determination of structure-activity characteristics of biologically-active substances on the basis of their physicochemical parameters. Beginning in 1978, this aspect of drug research has received special emphasis at the Institute of Physiologically Active Substances of the USSR Academy of Sciences as it represents a rational and economical approach based on solid scientific facts and, in the future at least, can obviate the need for large-scale animal testing to uncover desirable physiological or pharmacological effects. Further success along this line of research will, in the authors' opinion, depend on a better understanding of the transformations that drugs and other chemical undergo in an aqueous environment, appropriate appreciation of the electron-donor and acceptor capabilities of active sites interacting with the biotarget

(receptor), better characterization of drug/chemical conformational changes, and correlation of structural parameters with biological effects. References 15: 14 Russian, 1 Western.  
[607-12172]

UDC 577.322.53:591.145.2-812.62:543.42

CIRCULAR DICHROISM AND FLUORESCENCE STUDIES ON LONG-CHAIN NEUROTOXINS OF NAJA NAJA SIAMENSIS AND NAJA NAJA OXIANA VENOM

Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 9, No 6, Jun 83 (manuscript received 30 Dec 82) pp 756-767

SURIN, A.M., PLUZHNIKOV, K.A., UTKIN, Yu.N., KARLSSON, E.\*, TSETLIN, V.I. and SHAROV, V.A.\*\*, Institute of Bioorganic Chemistry imeni M.M. Shemyakin, USSR Academy of Sciences, Moscow; \*Institute of Biochemistry, Uppsala, Sweden; \*\*Institute of Biophysics, USSR Ministry of Health, Moscow

[Abstract] Circular dichroism and fluorescence studies were conducted on the long-chain neurotoxins derived from the venom of *Naja naja siamensis* (STX) and *Naja naja oxiana* (NT-I) to evaluate the effects of a change in pH on the conformation of STX and NT-I and the immediate microenvironment of tryptophan residues from changes induced in overall conformation by the introduction of acetyl, spin, or fluorescent labels. Ionization of the His<sup>22</sup> residue in STX (pK 5.4-5.6) altered its conformation and varied the microenvironment of the invariant Trp<sup>29</sup> residue in the pH range 4-7.5. Titration of NT-I over this pH range had no effect on the conformation of the molecule, in which the sole His residue is located on the C-terminal fragment. Similarly, dansylation of lys<sup>39</sup> and lys<sup>60</sup> residues in NT-I was without effect on conformation. These observations on the conformation of STX and NT-I in solution are in general agreement with information on polypeptide chain folding in crystalline STX deduced from x-ray data. Figures 8; references 33: 8 Russian, 15 Western.  
[610-12172]

UDC 547.963.32.07:577.323.425

ORGANOPHOSPHORUS ANALOGUES OF BIOLOGICALLY ACTIVE COMPOUNDS. PART 12. SYNTHESIS AND PROPERTIES OF P<sup>1</sup>, P<sup>4</sup>-BIS(5'-ADENOSYL)TETRAPHOSPHATE AND ITS PHOSPHONATE ANALOGUES

Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 9, No 6, Jun 83 (manuscript received 8 Dec 82) pp 838-843

TARUSOVA, N.B., SHUMYANTSEVA, V.V., KRYLOV, A.S., KARPEYSKIY, M.Ya. and KHOMUTOV, R.M., Institute of Molecular Biology, USSR Academy of Sciences, Moscow

[Abstract] A method has been developed for the ready synthesis of P<sup>1</sup>, P<sup>4</sup>-bis(5'-adenosyl)tetrphosphate(I) from ADP at 4°C in aqueous pyridine using

N,N'-dicyclohexylcarbodiimide as the condensing agent. Phosphonate analogues of I (which are refractory to enzymatic hydrolysis) were synthesized for eventual use in metabolic studies. One congener contained a CH<sub>2</sub> group between P<sup>2</sup> and P<sup>3</sup> atoms, and another contained CH<sub>2</sub> groups between the P<sup>1</sup> and P<sup>2</sup> and the P<sup>3</sup> and P<sup>4</sup> atoms. Structure of these compounds were confirmed and characterized on the basis of UV, NMR, and CD spectra. Figures 2; references 14: 2 Russian, 12 Western.  
[610-12172]

UDC 612.822.1:577.352.465

#### EFFECTS OF OPIATES ON Ca<sup>2+</sup> TRANSPORT INTO SYNAPTOSOMES

Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 9, No 6, Jun 83 (manuscript received 29 Dec 82) pp 849-851

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[Abstract] Studies conducted with Wistar rat brain synaptosomes showed that morphine, naloxone (opiate antagonist), and [D-ala<sup>2</sup>, D-leu<sup>5</sup>]-enkephalin inhibited K<sup>+</sup>-stimulated Ca<sup>2+</sup> uptake. These agents affected slow Ca<sup>2+</sup> influx rather than the initial rapid uptake. Of particular interest is the fact that naloxone itself was inhibitory and that it did not counteract the effects of morphine. Figures 2; references 9: 3 Russian, 6 Western.  
[610-12172]



UDC: 612.0:577.49:578.087.1

ANALYSIS OF DIURNAL RHYTHMS OF PHYSIOLOGIC FUNCTIONS OF SAILORS ON WATCH

Moscow FIZIOLOGIYA CHELOVEKA in Russian No 4, Jul-Aug 83 (manuscript received 25 Jul 81) pp 557-561

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[Abstract] Results are presented from studies of the diurnal rhythms of sailors constantly at work on the same watch each day. The studies were performed on two ships on voyages from Leningrad to Australia and return around Africa, and Odessa to Japan and return through the Suez Canal. Groups of sailors standing watch 4 hours with 8 hours rest were observed, as well as sailors working straight day-shifts. Standing watches was found to cause a change in the wave of diurnal rhythm of physiologic functions, primarily in the form of amplitude-phase changes of the 12 hour component. Consideration of the 12 hour component in all such studies is necessary. The influence of the ultradian sensor related to the work-rest cycle on the diurnal rhythms of physiologic functions depends on the relationship of phases of the sensors to the phase of the endogenous generated rhythm. Work on different watches is not equivalent to straight day-shift work. A differentiated approach is required for the development of recommendations for maintenance of working capacity. Figure 1; references 15: 7 Russian, 8 Western.  
[716-6508]

DISTRIBUTION OF NUCLEOLAR NUCLEIC ACIDS IN PURKINJE CELLS UNDER VESTIBULAR STIMULATION OF IMMOBILIZED RATS

Moscow BYULLETEN' EKSPERIMENTAL'NOY BIOLOGII I MEDITSINY in Russian No 4, Apr 82 (manuscript received 13 Oct 81) pp 105-108

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[Abstract] A study was made of the distribution of nucleolar nucleic acids as a function of the functional loading of Purkinje cells as well as other non-specific action applied to the cells. Wistar male rats about one month in age, 40-50 g mass were horizontally rotated at 60 rpm for one hour. The animals were contained in tight boxes attached to a disk connected to an electric motor. Three rats each were decapitated after 10, 20, 30, 40, 50 and 60 minutes rotation and the nodulus vermis cerebelli removed. After fixation in a mixture of formalin, alcohol and acetic acid for one hour, fragments were placed in paraffin. Sections 5  $\mu$ m thick were photographed in UV light before and after extraction of nucleic acids with 5% HClO<sub>4</sub>, 90°C, 6 minutes. A correlation was observed in control animals not subjected to rotation. Figures 3; references 5: 4 Russian, 1 Western.

[258-6508]

## PUBLIC HEALTH

### EQUALIZATION OF URBAN AND RURAL MEDICAL SERVICES DISCUSSED

Alma Ata NARODNOYE KHOZYAYSTVO KAZAKHSTANA in Russian No 5, May 83

[Article by P. Petrov, doctor of medical sciences, deputy minister of health of the Kazakh SSR, and G. Popov, doctor of medical sciences, professor of the Economics Department of the Moscow State University: "Ways of Equalizing Medical Services to Urban and Rural Population"]

[Text] The principles of Soviet public health services organically ensue from the very essence of social relations under socialism. Both for urban and for rural areas, they are based on the principles of statewide planning, free availability of medicosanitary help for all strata of the population, unity of science and practice, and wide participation of the workers in solving the problems of maintaining working ability and active longevity.

However, the great differences in the climatic, geographic and economic conditions, the nature of the population distribution, indexes of population density, road conditions, transportation, communications, working and living conditions, and many other factors and peculiarities are responsible for the special characteristics in the organization of medical aid to the rural population. In spite of the obvious advantageous of large settlements, 30% of the country's population still live in small settlements (up to 500 people).

Due to these peculiarities, the system of medical aid to the rural population in the USSR is based on the principle of stages (stage I -- rural medical clinics, uchastok hospitals, feldscher-midwife centers; stage II -- rayon establishments; stage III -- city, oblast and republic establishments). At each subsequent stage, patients receive more skillful and specialized medical assistance than at the preceding one.

With respect to its content, significance and volume, outpatient polyclinic service occupies an exceptionally important place. It is a mass form of the organization of medical services. One of its leading organizational principles is the uchastok principle. It satisfies the needs of public health services the best, makes it possible to achieve integrated solutions of medical, ecological, sociohygienic problems of disease and traumatism prevention, sanitation of the environment, improvement of working, living and relaxation conditions, and developing a conscientious attitude in the Soviet people toward their health.

In 1981, there were 2.9 billion medical visits, including home visits, against 2.3 billion in 1975. On the average, there were 10.8 medical visits per capita, including 13.8 for the urban residents and 5.6 for rural residents. Moreover, there were also 4.5 visits of the rural resident to intermediate medical personnel. The level of medical services available to rural population in the USSR is not any lower than the level of outpatient services to the entire population in economically developed capitalist countries.

The data of Table 1 show the dynamics of the growth of outpatient polyclinic services in the USSR.

Table 1				
Number of Visits in a Year per Resident (including home visits) in the System of the USSR Ministry of Health*				
Index	1960	1964	1975	1981
Number of medical visits per urban resident	8.5	9.2	11.3	12.8
Number of visits per rural resident				
-- total	4.8	5.3	8.6	10.1
Including: to physicians	2.1	2.5	4.3	5.6
to intermediate medical personnel	2.7	2.8	4.3	4.5

\*See: Public Health Services in the USSR During the Tenth Five-Year Plan, Moscow, 1981, pp 56-57; National Economy of the USSR, 1922-1982, Moscow 1982, p 452

The attendance level of urban population increased by 47% in 21 years, while the same index for the rural population more than doubled. With approximately the same level and nature of the disease rate among urban and rural population, the attendance of physicians by the latter is less than one half of the attendance level of urban population. This index for the union republics is as follows: there was an average of 5.6 medical visits per rural residents in 1981 for the USSR, while there were 4.2 visits in the Tajik SSR, 4.7 in the Azerbaijan SSR, 5.5 visits in the Georgian SSR, 8.4 visits in the Lithuanian SSR, etc.

There is an opinion that the problem of the accessibility of rural population to medical aid can be solved only by increasing the size of the medical personnel in rural treatment and prophylactic establishments, as well as in urban establishments serving rural population. Without going into the problems of medical, social, organizational and economic nature, we should object to this statement, because there is no direct relationship between the attendance level and level of saturation with physicians. A thorough analysis indicates that in the total number of visits only 3-4.5 visits per rural and urban resident are in connection with illnesses, and the remaining are preventive or dispensary visits. It is also notable that in the union republics, krays and oblasts with a low population density, large rayons without good roads, transportation, communications, etc., there is a maximum level of the volume of outpatient polyclinic services regardless of the number of physicians. It is approximately 5-6 visits at all of the three stages with a ratio of 20-30 physicians per 10,000 people of the rural population.

When the number of physicians increases further, the attendance by the patients almost does not increase, and this results in a lower load for physicians.

The indicators of the availability of physicians for the rural population of the union republics are within the limits of 20-33 per 10,000 people (this is much higher than the availability of physicians for the total population of economically developed capitalist countries).

In 1981, hospital aid was provided by 33,100 hospitals with three million 384 thousand beds, which is 12.6 beds per 1,000 people (this is also the highest indicator among economically developed socialist and capitalist countries). The union republics had from 8.4 beds per 1,000 people in Armenia and 10.1 in Tajikistan to 13.1 in Kazakhstan and 13.8 in the Latvian SSR. In 1981, 64 million patients and women in labor were hospitalized in the hospitals of the country, including 41 million urban and 23 million rural residents. For the country as a whole, the hospitalization level of urban population was 241 and of rural population -- 236 per 1,000 people, respectively. This indicator in the system of the USSR Ministry of Health in 1980 varied considerably: from 147 in Armenia, 163 in Azerbaijan and Turkmenia, to 248 in Kazakstan, 256 in the Russian Federation and 258 in Uzbekistan. In nine union republics, including Kazakhstan, the hospitalization level of rural population in the system of the USSR Ministry of Health was higher than for urban population (on the average, 221 per 1,000 urban residents). The hospitalization level of rural population increased at a faster rate than that of urban population, which can be seen from Table 2.

Table 2  
Dynamics of Hospitalization Levels of Urban and Rural Population in the USSR Ministry of Health\*

Index	1940	1950	1960	1975	1980
Percentage of hospitalization of urban population	12.9	15.2	19.1	21.3	22.1
Percentage of hospitalization of rural population	5.1	7.1	16.2	22.5	23.6
Ratio of hospitalization level of urban population to that of rural population	2.5	2.1	by	by	
	times	times	5.6%	6.8%	

\*See: Public Health Services in the USSR during the Tenth Five-Year Plan, Moscow 1981, p 62; National Economy of the USSR, 1922-1982, Moscow, 1982, p 452.

As is known, the main material funds, highly specialized personnel, considerable numbers of other personnel and budgetary allotments are concentrated in hospital establishments. The process of enlarging hospitals in the country, particularly rural, rayon and uchastok (whose average capacity increased respectively from 74 and 14 beds in 1955 to 199 and 34 in 1978; average capacity of oblast hospitals during these years increased from 386 to 745 beds), had a positive effect on the improvement of their material and technical base, enlargement of their medical personnel and equipment with therapeutic and diagnostic apparatus and equipment, as well as transportation facilities.

It is mentioned in the materials of the May (1982) Plenum of the CPSU Central Committee that extensive measures were implemented in the country in the last 15 years for solving social problems of rural areas and reconstruction of rural populated centers. However, these measures are still insufficient. The CPSU Central Committee and the USSR Council of Ministers, in their resolution "On Measures for Further Improvement of Housing, Municipal and Domestic Services and Social and Cultural Conditions of the Rural Population" (1982), are considering the measures on social transformation of rural areas as a constituent part of the Food Program of the USSR.

The complex measures for the socioeconomic development of rural areas for 1982-1990 envisaged by this resolution are directed toward further transformation of rural populated centers into well-planned settlements, a considerable increase in the construction volume of housing and communal and cultural facilities. In the nineteen eighties, it is planned to allot approximately 160 billion rubles for the development of the social infrastructure and roads in rural areas. It is planned to create the necessary conditions for retaining residents in rural areas by considerable improvements in the cultural, living, medical and trade services of the rural population.<sup>1</sup>

It is not easy to realize this complex problem. For example, along with the difficulties of bringing closer together the levels and quality of medical services to the urban and rural population and overcoming their differences, it is just as difficult to solve certain very important theoretical problems. How should we understand the equalization of services to urban and rural population?

Special characteristics of working and living conditions of urban and rural population, differences in the factors forming their socioeconomic needs, as well as the conditions and methods of their realization will always dictate different approaches in solving their social problems. K. Marx wrote that "certain inequalities in living conditions will always exist among individual countries, oblasts and even localities which can be minimized but will never be possible to eliminate completely. Inhabitants of the Alps will always have different living conditions than inhabitants of the plains".<sup>2</sup>

It is to be supposed that in this example he meant not only natural and climatic conditions. The main problem of health services in a rural area is the difficulty of organizing outpatient polyclinic services and particularly specialized medical aid to the rural population rather than hospital aid. The reason for this is a considerable number of small scattered populated centers, low-capacity hospitals located far from the main treatment and prophylactic establishments -- central rayon hospitals intended for providing main specialized types of help (12-15 specialties). These factors become particularly greater in providing specialized medical help to inhabitants of mountainous areas, livestock breeders working at distance pastures, loggers, reindeer breeders, as well as a migrating group of population -- geologists, gas pipeline builders and railroad builders who often have special living conditions and extreme natural and industrial conditions.

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1. Food Program of the USSR for Period of up to 1990 and Measures for Its Realization, Moscow, 1982, pp 13-14, 58, 100.

2. K. Marx and F. Engels. Works, Vol 31, p 104.

The increasing similarity in the agricultural and industrial production with the highest level of mechanization cannot fully remove certain technological peculiarities: there will remain the vast extent of the fields, forests, seasonal nature of work, differences in the tools of labor in agriculture, dependence of their production on the weather conditions, etc. These differences do not ensue from the economic relations of people, but result from the agrobiological peculiarities of agricultural production.

Intensive industrialization of agricultural labor and the entire way of life of the modern countryside inevitably leads to a closer interaction than before with the city and its social infrastructure. Consequently, the overcoming of the existing differences between the city and the countryside consists in minimizing the differences in the level and quality of medical services, in striving for a fuller satisfaction of the needs of the population according to differentiated norms and standards (and they will always be different) with different organizational forms of medical services to the rural population.

The meaning and the final goal of the leveling of services to the population consists in equally full satisfaction of personal and social needs in medical aid and sanitary and epidemiological services. The main condition in the organization and planning of medical aid must be the criteria of medical, social, and economic effectiveness. Although preference must be given to medical and social criteria and indicators, this does not give the right to be guided by the achievements of medical and social effects "at any price" for the simple reason that health services as a branch of the national economy cannot go beyond the limits of a single national economic complex, especially because the material and labor resources will always be limited.

The point is that it is extremely difficult to find a single standard for a model of the organization of medical aid even for urban population, not to mention rural population. Urban population in the sense we often use it is abstract and averaged to a considerable degree. However, with a concrete approach to the evaluation and decision making we have to encounter socioeconomic characteristics which are averaged to such a degree that they cannot reflect the objective reality of individual cities contained in their entire aggregate being analyzed. The extreme variants in the nonuniformity of urban settlements are too great with respect to the population size (cities with a population of one million people are put together with cities having a population of 1000-2000 people), demographic processes, socioeconomic and cultural development, as well as with respect to the living standards and the way of life. It is even considerably more difficult to speak of a standard for a model of medical services to rural population. In this connection, the selection of optimal organizational forms of medical services to rural population in various economic and geographic regions of the country acquires a special socioeconomic significance.

Three concepts have formed to date for further development of the organizational forms of hospital care for rural population. The advocates of the first direction point out the necessity of centralization of hospital capacities in large central rayon and numbered (zonal) hospitals, others are of the opinion that further development of hospital care for rural population must proceed along the road of preserving and strengthening rural uchastok hospitals and strengthening rayon hospitals. The advocates of the third concept consider it expedient to

create diversified specialized hospitals on the basis of existing rural uchastok hospitals as branches of central rayon hospitals and rayon numbered hospitals.

We strongly believe that all of the three concepts have the right to exist depending on local conditions and characteristics (extent, road conditions, transportation facilities, etc.) which have to be necessarily taken into consideration in selecting one or another form of the criteria of medical, social and economic effectiveness. It is more than probable that in many instances these criteria were not taken into consideration during the reorganization and reduction of the number of rural uchastok hospitals (from 12,900 in 1972 to 8,200 in 1980).

As is shown by analysis, the accessibility and hospitalization indicators are higher in regions with a relatively high population density and satisfactory road and transportation facilities with high-capacity rayon hospitals than with a decentralized system in rayons with a low population density. It follows from this that the organizational forms of medical services to rural population in some republics, krays and oblasts must be different depending on the local natural, geographic, climatic, economic, social, cultural, and other factors. Considerable role in this respect is played by traditions, habits and the adopted mode of life which, of course, must be formed in the necessary direction.

For the purpose of further improvement of organizational forms and the quality of medical aid to rural population, the USSR Ministry of Health envisages measures for strengthening central rayon hospitals as the main link of rural health services, increasing their capacity by 1985 to 250-400 beds, expansion of the network of interrayon specialized departments, strengthening of uchastok services, and the development of mobile types of ambulatory medical aid. However, mobile medical services are not very productive, economically ineffective and do not meet the basic requirements of the organization of medical aid -- the presence of a physician when he is needed. Medical services do not accumulate and cannot be stored up. Nevertheless, these types of services can perform a considerable prophylactic role.

A very urgent and complicated problem is the problem of increasing the volume and quality of outpatient polyclinic aid to rural population. There are two extreme points of view in this respect. One of them is to bring outpatient polyclinic care closer to the population by its decentralization and saturation with specialist physicians of central rayon, rayon, and uchastok hospitals and clinics in rural areas as well as hospitals and polyclinics (outpatient clinics) in cities and city-type settlements of up to 25,000 people.

The new norms for regular medical personnel adopted by the USSR Ministry of Health make it possible to add 60,000 positions for physicians, 80,000 positions for intermediate medical personnel and 43,000 positions for junior personnel, which will be an increase by 6.2 physicians, 8.2 medium medical workers and 4.4 junior and attending personnel per 10,000 people of rural population. Mobile medical facilities started being used widely for improving medical aid for residents of remote and almost inaccessible regions and livestock breeders working at distant pastures. In 1979, there were 320 such clinics, 141 clinicodiagnostic laboratories, 308 dental units and 1746 fluorographic units. In Kazakhstan alone, 174 children's and women's mobile consultation clinics make regular trips



between remote settlements. By the end of this five-year plan, 200 more such units will be added in the republic.

Both in the existing system of the organization of medical aid to rural population, and for many years to come, the rural medical uchastok will remain to be the primary and closest link of medical aid. Depending on local conditions, such as population density, the radius of the service area and means of communications, the size of the rural medical uchastok, even if it does not coincide with the administrative boundaries, can vary within the limits of from 2000-3000 to 6000-8000 people, approaching the city type with respect to its organizational forms of work.

The creation of large territorial medical uchastoks with consideration for the possibility of the expansion of rural settlements will make it possible for rural residents to have accessible outpatient aid at the first stage in the most popular specialities (therapy, pediatrics, dentistry). It should be kept in mind that the full load of physicians in outpatient clinics (therapist and pediatrician -- 1.5 position each) cannot be ensured in a uchastok serving 3000-4000 people. For the attendance at a level of 2.5-3 visits per resident a year at this stage, the rural medical uchastok must have not less than 6000 residents. Consequently, the size of the rural medical uchastok and its boundaries must be determined individually in each concrete case with consideration of the criteria of medical, social and economic effectiveness, and not "at any price". The organization of emergency medical services in rural areas also must be based on these criteria.

The Food Program of the USSR and Resolutions of the CPSU Central Committee and the USSR Council of Ministers set the goal of raising the level and improving the quality of medical services and sanatorium and health-resort treatment of sovkhoz and kolkhoz workers, provided for the strengthening of the material and technical base of rural health services, construction of outpatient polyclinic establishments and pharmacies, their equipment with modern medical and special equipment and motor transportation facilities, as well as to complete by 1985 the organization of emergency medical services everywhere in rural areas.

These directives provide for a considerable improvement of the quality and standards of medical care for rural population on the basis of the improvement of the work of primary links of public services, intensive development of mobile types of medical aid in rural areas, including dental, as well as expansion of services for rural residents with specialized establishments (subdivisions) of city health services. It was established that the construction of outpatient clinics in sovkhozes and other state agricultural enterprises and organizations must be accomplished through state capital investments allotted for the development of agriculture, and kolkhozes are recommended to construct such establishments at their own expenses. It is also envisaged to complete during this five-year plan installation of telephones in all therapeutic and prophylactic establishments and to equip stations (departments) of fast and emergency medical aid in rural areas with radio communication facilities.<sup>3</sup>

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3. Food Program of the USSR for the Period of up to 1990 and Measures for Its Realization, Moscow, 1982, pp 100, 103.

The Resolution of the CPSU Central Committee and the USSR Council of Ministers of 19 August 1982 envisages the development and implementation of a complex program for strengthening disease prevention and improvement of the population's health by further improvement of labor conditions and protection, implementation of sanitary and health-improvement measures intended for lowering the level of temporary disability, occupational disease rate, industrial traumatism and invalidism, improvement of the environment, activation of the work on hygienic education of the population, development of active relaxation of the population, introduction of mass physical culture and sports, expansion and improvement of the effectiveness of the use of sanatoriums and preventoriums, tourist and physical culture sports bases and other health establishments.

In order to raise the level of specialized medical aid to rural population and to overcome territorial and social differences, it is planned to conduct systematic consultation hours for the population at territorial polyclinics by highly skilled specialists of medical vuzes and scientific research institutes and to arrange trips of these specialists to rural treatment and prophylactic establishments. It will also be necessary to improve radically prophylactic activities of outpatient polyclinics, to increase the effectiveness of state sanitary inspection, particularly in the area of agricultural production and industrial hygiene, and to strengthen sanitary and epidemiologic stations in rural areas by creating interrayon laboratories in them.

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CSO: 1840/548

PREVENTIVE HEALTH CARE MEASURES DESCRIBED BY MINISTRY OF HEALTH OFFICIAL

Moscow SOVETSKAYA KUL'TURA No 81 in Russian 7 Jul 83 p 3

[Interview by O. Poltavets with USSR Ministry of Health Central Administration of Medical-Preventive Aid Deputy Chief V. Treskunov: "Be Healthy!"]

[Text] Preserving the health of the Soviet people is an affair of national importance. This was discussed at the June 1983 plenum of the CPSU Central Committee. Appearing at the plenum, CPSU Central Committee General Secretary Yu.V. Andropov noted that health issues will play an increasing role in the party's social policies. One stage of resolving this task--widespread disease prevention--is discussed by USSR Ministry of Health Central Administration of Medical-Preventive Aid Deputy Chief V. Treskunov.

[Answer] The basic principle of Soviet health care today is its preventive nature--that is, working to forestall disorders and preserve the health of society as a whole. This task, as urgent as it is vast, is being resolved primarily by medical organizations, but it also requires active interest and participation of state and social organs.

[Question] What specific form should this participation take?

[Answer] Implementation of social-economic and medical measures. Especially environmental protection, improving social-hygiene labor conditions, and preventing work-related, chronic, and infectious diseases. In short, widespread prevention, in order to be effective, requires that the tasks it involves be solved in a systematic, comprehensive manner.

[Question] What is the role of preventive dispensarization in resolving these tasks?

[Answer] Preventive dispensarization or secondary prophylaxis, is the next stage, indisputably more complicated, directly aimed at finding a disease or the condition which precedes the disease--the so-called disease fore-runner. It is known that certain portions of the population have already gone through a preventive dispensary, long ago. But today it is possible and urgently recommended to make a step-by-step transition to a yearly preventive dispensarization of the entire population.

About a year ago, the CPSU Central Committee and USSR Council of Ministers passed the decree "On Additional Measures for Improving Health Care of the Population." This document served as the impetus to create an integrated program to reinforce disease prevention, which we worked out jointly with the USSR Academy of Medical Sciences. The program, which covers the period up to 1990, calls for measures to provide timely examinations, high-quality diagnosis, and an inventory of all visits to the physician, which is especially important for finding disease and treating it in a timely fashion. In addition, it calls for creating prophylaxis departments in large polyclinics. This idea is new, but it is already catching on. For several years medical-sanitary sections of large industrial enterprises, as well as some polyclinics, have been running prophylaxis departments which conduct pre-physician examinations of workers. Such departments include offices for initial gathering of reports about the complaints and illnesses of the people examined, and where it is decided what sort of medical specialist the patient should be directed to. Offices for early detection of pretumor and cancerous diseases, for preventive fluorography, and health education have begun active operation.

If pathology is discovered, the patient is directed to a specialist for more thorough testing. Moreover, the physician already has the reports from the prophylaxis department, which simplifies diagnosis.

[Question] Workers in enterprises get periodic prophylactic examinations. But what about preventive dispensarization for children, people on a pension, and other segments of the population?

[Answer] The transition to universal dispensarization is a long process which requires step-by-step solution of a whole set of problems. At the present stage we are resolving the task of prophylaxis among the working members of the population, in particular what is called the decreed population. This includes people who are subject to risk factors in some degree--workers in certain spheres of production. They all undergo dispensarization at least once a year, and certain segments even oftener.

But it would be a mistake to think that the rest of the population is outside the field of vision of health care organizations. Practically all older people, invalids, and participants in the Great Patriotic War are listed in the medical archive by residence, where they periodically undergo prophylactic examinations and dispensarization, as a result of which the necessary course of treatment is prescribed and followed. In a certain sense, these people are the most organized and conscientious segment of the population, taking serious care of their health.

Concerning the little citizens of our country, physicians are beginning to be concerned about them from the first day, the first hour of their appearance on earth--this is the human essence of Soviet health care. Children are systematically observed by medical specialists in their place of residence, and additionally in children's pre-school establishments, schools, and then in professional-trade schools, technical colleges, and VUZes.

[Question] What about organizing dispensarization for the rural population? Won't the seasonal nature of their work get in the way of dispensarization for rural workers?

[Answer] It is planned that every centralized rayon hospital will have offices for prophylactic and rehabilitative treatment. Over much of the country--the RSFSR, the Ukraine, Belorussia--such offices are already functioning successfully. Hospital personnel plan their work to coincide with the rhythm of life of people who live in the towns, villages, and farmsteads of their rayon. During the spring and autumn field work, brigades of specialists travel to the location to give prophylactic examinations and consultation aid to the population. They are helped in this by staff members of oblast medical and scientific-research institutes which treat rural rayons.

[Question] Resolving the task set by CPSU Central Committee General Secretary Yu.V. Andropov at the June 1983 CPSU Central Committee Plenum--that is, the transition to yearly dispensarization of the entire population--is practically done already. Is it too soon to talk about the initial results?

[Answer] Not at all. We not only can, we should. In this connection, I cannot help but mention the positive experience of the medical-sanitary departments of the Karagandaugol' Association, the Gorkiy Automobile Plant, the Chelyabinsk Tractor Plant, the Automobile Plant imeni Likhachev, and many other enterprises which have successfully undertaken prevention work. They have organized things so that the examination is during working hours, prophylactic examinations are from one to four times a year, and there is a dispensarization follow-up and constant aid to people who suffer from chronic disorders.

The results have not been slow in coming. Just in the past year the sickness rate with loss of work capability has lowered significantly.

[Question] What lies in the future for resolving the problem of disease prevention and organizing yearly dispensarization for the entire population?

[Answer] One of the courses followed will be to break up regional institutions into therapeutic and pediatric uchastoks, making it possible to reduce the number of people going to a single medical office, which, naturally, will make it possible for each patient to get more attention. A great part in resolving the problem is being played by the adoption of new equipment and technology, medical instruments which make it possible to carry out multiple laboratory tests at the same time. Some of these polyanalyzers, especially cardioscopes and other instruments used in examinations, are producing outstanding results.

I repeat, effective prevention requires a joint effort, business contact between physicians and enterprise administrations aimed at resolving the nationwide task--preserving the health of every individual and society as a whole.

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CSO: 1840/558

## BRIEFS

**PHYSICS IN MEDICINE**--Joint research by physicians and physicists, conducted in accordance with an agreement on scientific and technological collaboration, has made it possible to shorten the new technology's path from academic laboratories to the clinics. Scientists at the laboratory of laser systems and apparatus of the Physics Institute, AN BeSSR [Belorussian SSR Academy of Sciences] have sent a laser apparatus system to physicians at the Belorussian Kidney Transplant Center. Here the laser will be used in our country for the first time for the postoperative treatment of kidney transplant patients. The transplant center is not the first therapeutic institution equipped with apparatus developed by Belorussian physicists. Minsk physicians have already been successfully using the healing light for several years to treat trophic ulcers and osteochondrosis, chronic pneumonia and radiculitis, wounds that have failed to heal after a long time and bronchial asthma. They are also starting to use it in reflex therapy--the rays act upon biologically active points, eliminating various allergies. "The Belorussian public health department is beginning to equip itself even more with the achievements of modern science," N.Ye. Savchenko, BeSSR Minister of Health, laureate of the USSR State Prize and academician, Academy of Sciences BeSSR, told our BELTA correspondent. The program "Fundamental sciences--medicine" enabled the best efforts of leading institutes of the republic Academy of Sciences, the Belorussian State University imeni V. I. Lenin and other institutions of higher learning to be directed to this work. Close creative contacts help us to improve the effectiveness of scientific research, to hasten the adoption of medical science achievements in daily therapeutic practice, and to concentrate our joint efforts toward the solution of major health problems. Academy institutes are already conducting research in the area of brain physiology, the biology of the aging process, and the prevention and cure of oncologic, cardiovascular and drug disease. [By BELTA correspondent G. Novikov] [Text] [Minsk SOVETSKAYA BELORUSSIYA in Russian 8 Jul 83 p 4] 12262

**EMERGENCY MEDICINE**--The USSR Ministry of Health has examined the article by N. Kaverin (LITERATURNAYA GAZETA No. 11, 1983) "OZ [expansion unknown; Oblast Health Center?] and All of Us" and feels that it touches upon a number of current work organization problems in the first aid and emergency medicine service. N. Kaverin correctly raises the question of the groundlessness of sending people to "OZ" in cases where the required medical care can be rendered under polyclinic/outpatient conditions. Undoubtedly, a definite percentage of these people were sent there due to organization problems in the operating conditions of outpatient/polyclinic institutions. They have all recently made the transition to new operating conditions: a six-day work week has been established, beginning at 8:00 a.m. and ending at 9:00 p.m. (8:00 p.m. in individual cases) and on Saturdays beginning at 9:00 a.m. and ending at 6:00 p.m. Internists and pediatricians are on duty from 9:00 a.m. to 6:00 p.m. on Sunday. Throughout the entire working day, physician's house calls are registered. The fact that there will be certain calls from a patient or his relatives that will prove to be groundless in the opinion of the emergency team cannot be ruled out. This, however should not serve as a basis or a right for the team to tell the patient or his relatives that "the physician was called for nothing." Indeed, it is possible that "nothing serious at all" could prove to be the

beginning of the development of an acute illness which the emergency physician was not able to "catch" since no lab tests had been done on the patient or because of the low level of his professional training. Directors of emergency and first aid medical services must constantly and, more importantly, scrupulously work at improving the practical qualifications of each physician individually, and must know all of their weak and strong points. It is only in this way that a high level of emergency medical care can be attained. This means that not one case of lack of attention by a physician to his patient, rudeness to him or his relatives or improper fulfillment of his professional duties should pass without consequences. Each time that this occurs, measures that have been set down by the law in force must be taken. At the present time, the ministry is finishing the drafting of measures to further improve first aid and emergency medical care to the population of our country. These measures provide for the development and reinforcement of the material base of first aid and emergency care institutions, drawing up staff physicians' duties, systematic improvement of qualifications for physicians and physicians' assistants at centers, and more complete provision of emergency medical care institutions with modern medical apparatus, instruments and drugs. [By Ye. Novikova, USSR Deputy Minister of Health] [Text] [Moscow LITERATURNAYA GAZETA in Russian 20 Jul 83 p 15] 12262

MEDICAL ETHICS DISCUSSED--"A Visit to the Physician" is the title of an article published here on 13 April. It stated that many letters are received by the editor, in which patients express their appreciation to physicians for their attentive and sensitive attitude, and relevant facts were cited. Along with such letters, there were reported instances when physicians were not tactful and sensitive enough when patients came to them or else when they refused to give medical care for formal reasons. As the editorial office was informed by O. K. Savel'yev, deputy head of the Main Public Health Administration of the Leningrad Oblast, this article was discussed at all therapeutic and preventive institutions of Leningrad. At a meeting of the Main Administration, a basic assessment was also given to the facts contained in the article. It was conceded that there are some workers in certain medical institutions who break the rules of medical ethics, and this casts a shadow on the selfless work of the absolute majority of physicians, nurses and junior medical personnel. Disciplinary steps have been taken against the individuals mentioned in the article by the management of the institutions, and their behavior was discussed by employee groups. Specific steps are being taken to eradicate such negative elements in the work of the city's therapeutic and preventive institutions. In accordance with orders issued by the USSR and RSFSR ministries of health, the syllabus has been revised for students at medical institutes and schools, where a leading place is reserved to questions of medical ethics. In the process of certification for fitness to hold a particular position, the same importance is attributed to these questions as to professional training. Together with the obkom of the medical workers' trade union, a plan has been elaborated for educational work, which includes lectures, seminars and familiarizing medical workers with the best therapeutic and preventive institutions in the city [Text] [Leningrad LENINGRADSKAYA PRAVDA in Russian 4 Jun 83 p 2] 10,657

✓ MEDICAL CERTIFICATION OF DRIVERS--I. Smolik asks: "What is the procedure in appearing before the medical commission for driver applicants and recertification of drivers?" Two medical commissions have been established in Minsk which effect medical certification of drivers and applicants for driver jobs in order to determine their fitness for driving motor and electric vehicles in the city. The medical commissions for drivers have the following specialists: internist, surgeon, neurologist, ophthalmologist and otolaryngologist (women are also certified by an obstetrician-gynecologist). Other specialists are called in when indicated. When necessary, additional tests and consultations are scheduled, both in specialized therapeutic and preventive institutions (or departments), and in polyclinics located in the area where the applicant receives medical services. When coming for the physical, the applicant submits the following: passport or equivalent document; military service card (in cases of recertification of a driver, a driver's license, as well as referral from place of work with mandatory indication of type of vehicle drive must also be submitted); two regulation passport size (6x4 cm) photos; reports from neuropsychiatric and drug addiction dispensaries in the area of the subject's residence; receipt showing payment for the medical examination to account No 142543 in the Soviet department of Gosbank. Disabled veterans of the Great Patriotic War and other disabled vets do not have to submit this receipt. There is an established form that is issued to individuals deemed fit to drive a vehicle. The medical certificate of driver fitness must be on the person of the driver of a private motor vehicle when he is driving, as well as when the vehicle undergoes annual inspection. If it is lost, the medical certificate is reissued after a second medical certification on general grounds. In the city of Minsk, the drivers' medical commissions work at Polyclinic No 24, 48 Karbysheva Street (Zelenyy Lug Rayon). The offices are open from 0800 to 2100 hours. Office hours are 1400 to 2100 hours on Mondays and Wednesdays. The offices are closed on Sundays. This explanation was given by T. N. Levkovich, chief physician at Polyclinic No 24 [Text] [Minsk SOVETSKAYA BELORUSSIYA in Russian 21 Jul 83 p 4] 10,657

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TASKS OF PUBLIC HEALTH AND MEDICAL SCIENCE IN FURTHER DEVELOPMENT OF ONCOLOGIC MEDICAL AID IN LIGHT OF DECISIONS OF THE 26TH CPSU CONGRESS

Moscow VESTNIK AKADEMII NAUK MEDITSINSKIKH NAUK SSSR in Russian No 12,  
Dec 82 (manuscript received 7 Jul 82) pp 8-16

BURENKOV, S.P.

[Abstract] The extensive development of oncologic service in the last 10 years is described. The USSR Academy of Medical Sciences Oncological Scientific Center in Moscow heads a network of scientific research institutes and 250 regional and municipal oncological preventive dispensaries involved in providing these services. New types of buildings for oncological dispensaries with 450 beds are being placed in operation. The cancer registry shows a trend toward a decrease in the incidence of cancer in the last 10 years. Epidemiological studies showing the relationship of incidence of cancer to a poor diet are described and discussed. Regions of prevalence of certain types of cancer are described and primary prophylaxis measures are discussed. Figures on survival rates after detection of cancer are presented. Early detection methods being used in the USSR are described. These methods include use of fluorography to detect lung cancer and pulmonary diseases and the use of fluoromammography procedures and thermography for breast-cancer detection. Changes in procedures for treating cancer are described. Surgery is now being used with combined, complex and radiological treatment to a greater extent. Aspects of medical treatment of cancer is discussed. Fifteen new anti-cancer preparations have passed clinical tests and have been recommended for use by the USSR Ministry of Health; 30 Soviet and 13 foreign anti-tumor preparations are being tested. Problems of rehabilitation of cancer patients are discussed. Research activities underway in both medical and non-medical institutes are described. Some shortcomings in cancer control are mentioned. Achievements in areas of medicine besides cancer are described and some aspects of health plans to be instituted in the 11th Five-Year Plan are discussed briefly.

[554-2791]

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DYNAMICS OF PSYCHONEUROLOGIC DISORDERS IN CLINICAL ASPECTS OF LONG-TERM SEQUELAE OF CHRONIC OCCUPATIONAL NEUROINTOXICATIONS

Moscow GIGIYENA TRUDA I PROFESSIONAL'NYYE ZABOLEVANIYA in Russian No 5, May 83 (manuscript received 1 Sep 82) pp 19-21

DUMKIN, V.N., IZRAEL', Ye.N., PRON'KOVA, Ye.N. and SHEFTELEVICH, O.S., Institute of Labor Hygiene and Occupational Diseases, USSR Academy of Medical Sciences; All Union Institute of General and Forensic Psychiatry imeni V. P. Serbskiy, Moscow

[Abstract] This study was performed in the department of occupational neurology of the Institute of Labor Hygiene and Occupational Diseases. Seventy two patients (50 females and 22 males, 30 to 45 years of age) were studied, including 17 with chronic mercury intoxication, 24 with chronic manganese intoxication and 31 with chronic carbon disulfide intoxication. At the time of examination all patients had been out of contact with the toxic substances for 6 to 15 years or more. None had predisposing hereditary factors or intolerance for alcohol. Symptoms included mild, hardly noticeable personality changes, more clearly seen with detailed psychologic examination of individual mental processes. Analysis of individual psychopathologic manifestations revealing the progradient nature of the process must include the influence of many factors including particularly the reactive capabilities of the personality, determined not only by constitutional but also by acquired specifics. The reaction of the personality to the pathologic process was also important to the need to overcome it. Frequent decompensation states lead to surrender to the disease, pathologic fixation on pain sensations, which may hinder proper evaluation of the patient's true status. Studies of the personality sphere revealed differences in the groups with different types of intoxication. For patients with manganese intoxication, a highly noncritical nature toward behavior, manifested as great differences between the patient's objective status and his self-concept, was characteristic. These patients had little initiative, were not spontaneous. Patients with mercury intoxication and to a lesser extent with carbon disulfide intoxication showed manifest emotional disorders requiring active correction. Hypochondria, obsessive-phobic and paranoid manifestations were characteristic. The disorders in mental activity were diffuse in nature represented by a decrease in mental working capacity, easy fatigue, inactivation of mental processes, emotional lability and memory defects. References 13 (Russian). [718-6508]

## PSYCHOLOGY

### DEVELOPMENT OF SOCIAL PSYCHOLOGY IN SOVIET PSYCHOLOGICAL SCIENCE

Moscow VOPROSY PSIKHOLOGII in Russian No 6, Nov-Dec 82 (manuscript received 10 Sep 82) pp 10-20

VODALEV, A.A.

[Abstract] A study is reported of the development of psychological science in the USSR on the example of social psychology. The principles of this important area of psychological science were laid down in the first years of existence of the Soviet Union when scientists were interested in objective illumination of phenomenologic regularities and mechanisms of functioning and formation of the human psyche. Contributions to the creation of these principles were made by psychologists in the RSFSR, Ukraine, Belorussia, Georgia, Armenia and other republics. Social science studies began to expand rapidly in the 1960's, with a qualitatively new stage of development of the science. This article does not go into details concerning the specifics of development of Soviet social science, but is quite rich in citation of scientists who have contributed to various indistinctly-described schools and developments. It recognizes several hundred scientists by name, with only brief allusion to their interests. These long lists of names are intended to show that studies in the area of social psychology have been broadly developed in the Soviet Union in many directions involving the participation of psychologists in all republics of the Soviet Union. Reference 1 (Russian). [574-6508]

### VARIOUS TYPES OF ASSOCIATIVE CONNECTIONS IN MEMORY ACTIVITY

Moscow VOPROSY PSIKHOLOGII in Russian No 6, Nov-Dec 82 (manuscript received 27 Apr 82) pp 115-120

KONOVALOV, V.F. and MEL'NIKOV, V.V.

[Abstract] Experiments were performed with two groups of students 22 to 29 years of age. In the first group of 50 students in 8 experiments they learned 14 senseless syllables from list number 1. In the second group of 36 students, 14 senseless syllables of list number 2 were learned. The instructions of the first group were that the syllables were to be freely reproduced. Instructions to the second group were that the syllables were to be reproduced at the end of reading of the list. After 7 days they learned groups of 3 syllables from list

number 1, and were immediately questioned as to the ease of learning the syllables, which were learned most easily and why, and each volunteer was asked to give a list of 5 syllables which were easily learned. The results of the test were used to determine two memory characteristics for each volunteer: volume of direct memory and productivity of memory. Graphs illustrate the dynamics of reproduction of syllables and forgetting of the syllables in three cases. The tests showed that in the free reproduction experiments the test subjects used organization of the elements learned based on time relationships in both direct and reverse order as a memorization technique, but the predominant mechanism for memorization was formation and functioning of direct connections, manifested as more-frequent development of scanning in the forward direction through the list. Another common strategy was association of the syllables with words which sounded similar. Figures 2; references 29: 23 Russian, 6 Western.  
[574-6508]

#### STUDY OF INTERFERENCE MEMORY MECHANISMS IN ADAPTATION

Moscow VOPROSY PSIKHOLOGII in Russian No 6, Nov-Dec 82 (manuscript received 16 Nov 81) pp 106-110

KOLYSHKIN, V.V.

[Abstract] A study is made of the possible role of interference in mechanisms of memory in the process of adaptation to different climatic-geographic conditions. The task of the study was to record interference in processes of memory under two variants: i) during interaction of indifferent information with indifferent information and, ii) during interaction of emotionally significant information with indifferent information; an attempt was then to be made to find certain possible physiological correlates of interference in the process of adaptation (to various climatic conditions). Test subjects were instructed to memorize words on a list. Twelve pairs of lists were presented each three minutes, each consisting of 14 words read at one word per second, interval between each pair of lists 3 to 4 seconds. In the case of the emotionally significant stimulus, the subjects were presented 12 times with individual lists of 14 indifferent words as in the first case, but in the middle of six lists two words were included which were selected by independent expert estimation to cause clear emotional images. Experiments were performed on 8 practically-healthy volunteers 20 to 28 years of age in Novosibirsk, in Pamir at 3600 m altitude and in Kamchatka after a 5 hour eastward flight during the monsoon season. The direction of interference of emotionally significant words was found to be opposite from the direction of interference of indifferent words. The recorded changes of interferences indicate a general and universal role of interference in memory mechanisms during the process of adaptation to various climatic conditions. Figures 3; references 15: 14 Russian, 1 Western.  
[574-6508]

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EXPERIENCE IN HYGIENIC EVALUATION OF PLAN DECISIONS FOR SANITARY AND DOMESTIC  
SERVICING OF ANIMAL HUSBANDRY WORKERS

Moscow GIGIYENA TRUDA I PROFESSIONAL'NYYE ZABOLEVANIYA in Russian No 11,  
Nov 82 pp 7-10

CHEBANOVA, O.V., LASHCHUK, G.N. and KOVNATSKIY, Ye.N., Kiev Institute of  
Labor Hygiene and Occupational Diseases

[Abstract] Results are presented from hygienic evaluation of standard plans for veterinary-sanitary inspections of animal husbandry complexes, undertaken both in the stage of development of planned documentation and at actual facilities built according to the plans. The effectiveness of the use of sanitary decontamination centers and the major reasons for not using the centers were studied by distribution of questionnaires. Some 1600 results of bacteriologic studies and 300 questionnaires were analyzed. Bacterial contamination of the open areas of the skin and specialized clothing of animal husbandry workers revealed a rather high level of contamination. The quality of sanitary treatment of workers was found to influence significantly the level of bacterial contamination of the skin. The effectiveness of utilization of veterinary-sanitary decontamination centers and procedures was found to be determined to a great extent by the plan decisions which had been made and strict observation of sanitary-hygienic conditions in animal husbandry complexes. References 8: 7 Russian, 1 Western.  
[571-6508]

CSO: 1840

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